“A DISSERTATION ON ENDOSCOPIC BIOPSY YIELD IN UPPER GASTROINTESTINAL MALIGNANCIES”

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CERTIFICATE

This is to certify that the dissertation titled **"*A DISSERTATION ON ENDOSCOPIC BIOPSY YIELD IN UPPER GASTROINTESTINAL MALIGNANCIES*"** is the bonafide work done by ***Dr. P.ARAVIND*,** Post Graduate student (2012 – 2015) in the Department of General Surgery, Government Stanley Medical College and Hospital, Chennai under my direct guidance and supervision, in partial fulfillment of the regulations of The Tamil Nadu Dr. M.G.R Medical University, Chennai for the award of M.S., Degree (General Surgery) Branch - I, Examination to be held in April 2015.

Prof.DR.C.BALAMURUGAN M.S
Professor of Surgery
Dept. of General Surgery,
Stanley Medical College,
Chennai-600001.

Prof.DR.S.VISWANATHAN M.S
Professor and
Head of the Department,
Dept. of General Surgery,
Stanley Medical College,
Chennai-600001.

PROF. DR.AL.MEENAKSHISUNDARAM, M.D., D.A.,
The Dean, Stanley Medical College, Chennai - 600001.

DECLARATION

I, **DR.P.ARAVIND** solemnly declare that this dissertation titled "***A DISSERTATION ON ENDOSCOPIC BIOPSY YIELD IN UPPER GASTROINTESTINAL MALIGNANCIES"*** is a bonafide work done by me in the Department of General Surgery, Government Stanley Medical College and Hospital, Chennai under the guidance and supervision of my unit chief. Prof. **DR.C.BALAMURUGAN,** Professor of Surgery. This dissertation is submitted to The Tamilnadu Dr.M.G.R. Medical University, Chennai in partial fulfillment of the university regulations for the award of M.S., Degree (General Surgery) Branch - I, Examination to be held in April 2015

Place: Chennai.

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CONTENTS

AIM

Aim of this study is to find the **optimal number of endoscopic biopsies needed to diagnose the upper gastrointestinal malignancies** in the patient who undergoes endoscopic evaluation in General Surgery department,Medical gastroenterology department,Surgical gastroenterology department endoscopic units of STANLEY MEDICAL COLLEGE HOSPITAL from may 2013 to august 2014.

MATERIALS AND METHODS

This is an observational study conducted in Goverment Stanely medical college hospital from may 2013 to aug 2014. Patients with upper gastrointestinal symptoms underwent esophagogastroduodenoscopy using forward viewing scope after getting the proper consent from them.procedure was done by well experienced endoscopist. In patients with suspected lesion of malignancy in the tract biopsies are taken. Number of biopsies aimed are eight and serially taken biopsies are labelled in four separate vials.each vial contains two consecutive samples in the 10% formal saline solution. Details of the site, extent, and type of the lesion were recorded. In case of haemorrhage or any complications the procedure is terminated with proper monitoring of patient until discharged.

REVIEW OF LITERATURE

Foregut

ESOPHAGUS

In 4 weeks old embryo, the respiratory diverticulum (lung bud) bulges at the anterior wall of the foregut at the junction with the pharyngeal gut .The diverticulum is divided by the tracheoesophageal septum from the posterior part of the foregut . By this the foregut is divided into a anterior part, the respiratory primordium, and a posterior part, the esophagus .

Initial period the esophagus size is less , it gets lengthened after the descent of lungs and heart rapidly . The surrounding splanchnic mesenchyme forms the muscular coat. Its becomes striated in upper two-thirds and vagus innervates it. In the lower third it is smooth and splanchnic plexeus innervates the lower muscle coat.

GROSS ANATOMY

The oesophagus is a muscular tube, typically 25 cm long. It is connecting the pharynx and the stomach.At the level of sixth cervical vertebra which corresponds to the lower end of the cricoid cartilage upper end of esophagus starts.From that junction in descends in superior and posterior mediastinum very close to the vertebral column anterior to it.At the level of tenth vertebra it passes through the diaphragmatic opening and at the level of eleventh vertebra it connects to the gastric orifice.There are two curves in esophagus which are very shallow in its vertical passage. It starts in the median plane, but at the root of the neck it courses towards left slightly, returning to the median plane gradually near the fifth thoracic vertebra, and at the seventh thoracic vertebra deviates left again, before it pierces the diaphragm. The oesophagus also bends in an anteroposterior plane to follow the cervicothoracic curvatures of the vertebral column; it can also bend slightly to the right as it is pushed by the aorta before bending to the left to reach the

oesophageal hiatus. In the gastrointestinal tract except for the appendix it is the narrowest part . Its lumen is constricted at the origin which is approximately fifteen centimetres from the incisor teeth and the region where it gets crossed by the aortic arch and the left principal bronchus .At forty centimetres from the teeth it crosses the diaphragmatic orifice ,there lies the gastro esophageal junction. These measurements are are important but it is highly variable from person to person.

CERVICAL OESOPHAGUS

The cervical oesophagus is posterior to the trachea and attached to it by loose connective tissue. The recurrent laryngeal nerves ascend on each side in or near the tracheo-oesophageal groove. Posteriorly are the vertebral column, longus colli and prevertebral layer of deep cervical fascia. Laterally on each side are the common carotid arteries and posterior part of the thyroid gland. In the lower neck, where the oesophagus deviates to the left, it is closer to the left carotid sheath and thyroid gland than it

is on the right. The thoracic duct ascends for a short distance along its left side

THORACIC OESOPHAGUS

The thoracic oesophagus is situated a little to the left in the superior mediastinum between the trachea and the vertebral column. It passes behind and to the right of the aortic arch to descend in the posterior mediastinum along the right side of the descending thoracic aorta. Below, as it inclines left, it crosses anterior to the aorta and enters the abdomen through the diaphragm at the level of the tenth thoracic vertebra. From above downwards, the trachea, right pulmonary artery, left main bronchus, pericardium (separating it from the left atrium) and the diaphragm are anterior. The vertebral column, longus colli, right posterior intercostal arteries, thoracic duct, azygos vein and the terminal parts of the hemiazygos and accessory hemiazygos veins, and, near the diaphragm, the aorta are posterior. A long recess of the right pleural sac lies between the oesophagus (in

front) and the azygos vein and vertebral column (behind) in the posterior mediastinum.

In the superior mediastinum, the terminal part of the aortic arch, the left subclavian artery, thoracic duct, the left pleura and the recurrent laryngeal nerve are left lateral relations. In the posterior mediastinum, the oesophagus is related to the descending thoracic aorta and left pleura. The right pleura, and the azygos vein as it arches forwards above the right main bronchus to join the superior vena cava, are right lateral relations. Below the pulmonary roots, the vagus nerves descend in contact with the oesophagus, the right mainly behind and the left in front; the vagi subsequently unite to form a plexus around the oesophagus. Low in the posterior mediastinum, the thoracic duct is behind and to the right of the oesophagus; at higher levels the duct is posterior, crossing to the left of the oesophagus at about the level of the fifth thoracic vertebra and then ascending on the left. On the right of the oesophagus, just above the diaphragm, a small serous infracardiac bursa may occur; it

represents the detached apex of the right pneumatoenteric recess.

VASCULAR SUPPLY AND LYMPHATIC DRAINAGE

Arteries

The cervical oesophagus is supplied by the inferior thyroid artery . The thoracic oesophagus is supplied by bronchial and oesophageal branches of the thoracic aorta . Four or five oesophageal branches arise from the anterior surface of the aorta and descend obliquely to the oesophagus, where they form a vascular chain that anastomoses above with the oesophageal branches of the inferior thyroid arteries, and below with ascending branches from the left phrenic and left gastric arteries.

Veins

Blood from the oesophagus drains into a submucous plexus and thence into a peri-oesophageal venous plexus from which oesophageal veins arise. Those from the thoracic

oesophagus drain predominantly into the azygos veins and, to a lesser extent, the hemiazygos, intercostal and bronchial veins . Those from the cervical oesophagus drain into the inferior thyroid vein. The left gastric vein meets the lower oesophageal veins at the oesophageal opening in the lesser curvature and then drains into the portal vein.

INNERVATION

The upper oesophagus is supplied by the branches of the recurrent laryngeal nerve and by postganglionic sympathetic fibres that reach it by travelling along the inferior thyroid arteries . The lower oesophagus is supplied by the oesophageal plexus, a wide-meshed autonomic network that surrounds the oesophagus below the level of the lung roots, and which contains a mixture of parasympathetic and sympathetic fibres.

Motor fibres to the striated and smooth muscle of the oesophageal wall travel in the vagus. Axons derived from neuronal cell bodies in the nucleus ambiguus travel via the

recurrent laryngeal nerve and supply cricopharyngeus and the striated muscle of the upper one-third of the oesophagus. Axons with cell bodies in the dorsal nucleus of the vagus pass through the oesophageal plexus and supply the smooth muscle that makes up the lower two-thirds of the oesophagus, after local relay in the oesophageal wall. Other branches are given off by the vagus as it travels through the mediastinum, and pass directly to the oesophagus. The vagus also carries secretomotor fibres to mucous glands in the oesophageal mucosa, and visceral afferent (sensory) fibres to cell bodies in its inferior ganglion.

Vasomotor sympathetic fibres destined for the oesophagus arise from the upper four to six thoracic spinal cord segments. Those from the upper ganglia pass to the middle and inferior cervical ganglia, where they synapse on postganglionic neurones that give rise to axons which innervate the vessels of the cervical and upper thoracic oesophagus. Those from the lower ganglia pass either directly to the oesophageal plexus or to the coeliac ganglion (via the greater splanchnic nerve), where they

synapse; postganglionic axons innervate the distal oesophagus. Afferent visceral pain fibres travel via the sympathetic fibres to the first four segments of the thoracic spinal cord: because these segments also receive afferents from the heart, it is sometimes difficult to distinguish between oesophageal and cardiac pain.

MICROSTRUCTURE

The tissues forming the thoracic oesophageal wall, from lumen outwards, are the mucosa (consisting of epithelium, lamina propria and muscularis mucosae), submucosa, muscularis externa and adventitia .

Mucosa

The mucosa is thick. At the gastro-oesophageal junction, a jagged boundary line separates the greyish-pink, smooth, oesophageal mucosa from the reddish-pink gastric mucosa, which is covered by minute bulges and depressions. Throughout its length, the oesophageal lumen is marked by deep

longitudinal grooves and ridges, which disappear when the lumen is distended, but obliterate the lumen at all other times.

Epithelium

The epithelium is a non-keratinized, stratified squamous epithelium, continuous with that of the oropharynx. In humans this protective layer is quite thick (300–500 μm) , and is not affected by oesophageal distension. The boundary between the oesophageal epithelium and its lamina propria is distinct but markedly uneven, because tall connective tissue papillae invaginate the epithelial base, assisting in the anchorage of the epithelium to underlying tissues . These papillae are permanent structures, also unaffected by oesophageal distension, and they are rich in blood vessels and nerve fibres. At the base of the epithelium there is a basal lamina, to which epithelial cells are attached by hemidesmosomes, as occurs in the oral mucosa.

Oesophageal epithelium is similar to other stratified squamous epithelia. It can be divided into a basal, proliferative layer, a parabasal layer of cells undergoing terminal differentiation, and a flattened layer of superficial cells or squames which retain their nuclei. The most superficial strata of cells contain a few keratohyalin granules, in addition to keratin filaments. The epithelial cell population is constantly renewed by mitosis in the cuboidal basal cells and the deepest parabasal cells. As they migrate towards the lumen, they become progressively polygonal and then more flattened, and are eventually desquamated at the epithelial surface. This sequence of events normally takes 2–3 weeks, and is markedly slower than in the stomach and intestine.

The epithelium is an effective protection against mechanical injury during swallowing because of its thickness and the presence of mucus at its surface. However, protection is limited by repeated exposure to the strongly acidic, protease-rich secretions of the stomach, as occurs abnormally during

reflux. Normally, the lower oesophageal sphincter prevents reflux, but if reflux does occur, ulceration and fibrosis of the oesophageal wall, accompanied by considerable pain and difficulties in swallowing may ensue. Exposure to acid may also cause oesophageal epithelial metaplasia to a gastric-like mucosa (Barrett's mucosa), or to more overt neoplastic changes.

Langerhans cells

Langerhans cells are present in the oesophageal epithelium. They are immature dendritic cells and resemble those found in the epidermis. They perform similar antigen-processing and antigen-presenting roles, which are important in immunostimulation of naive T cells and mucosal defence.

Lamina propria

The oesophageal lamina propria contains scattered groups of lymphoid follicles (mucosa-associated lymphoid tissue), which are especially prominent near the gastro-oesophageal

junction. Small tubular mucous glands occur in this region, and in the upper part of the oesophagus close to the pharynx.

Muscularis mucosae

The muscularis mucosae is composed mainly of longitudinal smooth muscle, and forms a thin sheet near the epithelium, the contours of which it follows closely. At the pharyngeal end of the oesophagus it may be absent or represented only by sparse, scattered bundles; below this it becomes progressively thicker. The longitudinal orientation of its cells changes to a more plexiform arrangement near the gastro-oesophageal junction.

Submucosa

The submucosa loosely connects the mucosa and the muscularis externa, and penetrates the longitudinal ridges of the

oesophageal lumen. It contains larger blood vessels, nerves and mucous glands. Its elastic fibres are important in the reclosure of the oesophageal lumen after peristaltic dilatation.

Oesophageal glands

Oesophageal glands are small tubuloacinar glands lying in the submucosa, each group sending a single long duct through the intervening layers of the gut wall to the surface. They are composed mostly of mucous cells, although they also contain serous cells that secrete lysozyme. In the region close to the pharynx, and at the lower end close to the stomach, the glands are simpler in form and restricted to the lamina propria of the mucosa. The mucosal mucous glands of the abdominal oesophagus closely resemble the cardiac glands of the stomach, and are therefore called oesophageal cardiac glands.

Muscularis externa

The muscularis externa is up to 300 μm thick, and consists of the outer longitudinal and inner circular layers typical of the intestine. The longitudinal fibres form a continuous coat around almost the entire length of the oesophagus, except that, posterosuperiorly, 3–4 cm below the cricoid cartilage, they diverge as two fascicles that ascend obliquely to the anterior aspect of the oesophagus. Here, they pass deep to the lower border of the inferior constrictor, and end in a tendon that is attached to the upper part of the ridge on the back of the cricoid lamina. The V–shaped space between these fascicles is filled by the circular muscle fibres of the oesophagus, which are thinly covered below by some decussating longitudinal fibres and above by the overlapping inferior constrictor. The longitudinal layer is generally thicker than the circular layer. Accessory slips of smooth muscle sometimes pass between the oesophagus and left pleura or the root of the left principal bronchus, trachea, pericardium or aorta, and are sometimes considered to fix the

oesophagus to these structures. Superiorly, the circular fibres are continuous behind with the inferior pharyngeal constrictor. In front, the uppermost fibres are attached to the lateral margins of the tendon of the two longitudinal fasciculi of the oesophagus. Inferiorly, the circular muscle is continuous with the oblique layer of muscle fibres in the stomach wall. In the upper one-third of the oesophagus, the muscularis externa is formed by skeletal muscle; in the middle one-third, smooth muscle fascicles intermingle with striated muscle, and this increases distally such that the lower one-third contains only smooth muscle.

ABDOMINAL OESOPHAGUS

The abdominal oesophagus is 1–2.5 cm in length, and is slightly broader at the cardiac orifice than the diaphragmatic aperture. It lies to the left of the midline and enters the abdomen through the oesophageal aperture (formed by the two diaphragmatic crura) opposite the level of the tenth thoracic

vertebra. It runs obliquely to the left and slightly posteriorly, and ends at the gastro-oesophageal junction/cardiac orifice of the stomach. The abdominal oesophagus lies posterior to the left lobe of the liver, which it grooves slightly, anterior to the left crus, the left inferior phrenic vessels and the left greater splanchnic nerve; its surface is covered in a thin layer of connective tissue and visceral peritoneum which contains the anterior and posterior vagi as well as the oesophageal branches of the left gastric vessels. The anterior vagus may be single or composed of multiple trunks, and is closely related to the outer fibres of the longitudinal muscle coat of the oesophagus. The posterior vagus is usually a single trunk and is less closely applied to the oesophageal muscle within the loose connective tissue, which makes its identification during surgery somewhat easier.

The abdominal oesophagus is effectively tethered to the diaphragm by connective tissue the phreno-oesophageal ligament. This is formed of two thickened bands of elastin-rich

connective tissue; the inferior phreno-oesophageal ligament is effectively an extension of the transversalis fascia extending beneath the parietal peritoneum as it is reflected from the diaphragm onto the abdominal oesophagus. The fibres are only loosely attached to the adventitial tissues and a variable amount of fat often lies beneath it, between the oesophageal wall and the crural sling. This oesophageal fat pad tends to act to tether the oesophagus to the fibres of the crura but tends to regress with age. On the thoracic side of the diaphragm the superior phreno-oesophgeal ligament is similarly formed from an extension of the subpleural endothoracic fascia. It is denser than its inferior counterpart with more elastin present and is tethered much more firmly through the muscle fibres of the oesophageal wall into the submucosal tissues. It may well act to restore lower oesophageal position after the movement engendered by the peristalsis of swallowing . Anteriorly, the subperitoneal connective tissue is particularly dense and blends with both the outer layer of the oesophageal wall and the apex of the crural fibres of the

diaphragm. On the posterior aspect the peritoneal reflection is extremely short since the crura lie steeply angled, and the posterior oesophageal wall has a much shorter ‘effective length' than the anterior. This short reflection of peritoneum is sometimes referred to as the gastrophrenic ligament and, via the peritoneum over the oesophagus continues directly onto the posterior surface of the stomach. It covers the oesophageal branches of the left gastric vessels and the coeliac branches of the posterior vagus and can thus be said to form an extremely short, wide mesentery to the abdominal oesophagus. In all but the thinnest individuals a pad of adipose tissue is found beneath the peritoneum covering the anterior surface of the lower abdominal oesophagus and the adjacent gastric wall. It is a useful surgical marker for the external location of the gastro-oesophageal junction.

VASCULAR SUPPLY AND LYMPHATIC DRAINAGE

Arteries

The abdominal oesophagus is supplied by oesophageal branches of the left gastric artery. These ascend as an anterior and posterior branch beneath the visceral peritoneum to supply perforating branches to the intramural and submucosal plexuses. The posterior surface usually receives an additional supply via branches of the upper short gastric arteries, the terminal branches of the oesophageal branches of the thoracic aorta and occasionally an ascending branch of the posterior gastric artery.

Veins

Veins drain via plexuses to the left gastric and upper short gastric veins .

Lymphatic drainage

Lymphatic drainage occurs to the left gastric and left and right paracardial nodes and from the posterior surface directly to the uppermost para-aortic nodes .

INNERVATION

The abdominal oesophagus is innervated by sympathetic and parasympathetic fibres. The parasympathetic fibres are derived directly from the peri-oesophageal thoracic plexus and to a lesser extent from the anterior and posterior vagi. They are motor to the distal oesophagus and both stimulatory and inhibitory to the functional lower oesophageal sphincter (LOS), maintaining both background tone and co-ordinating distal oesophageal peristalsis with relaxation of the LOS during swallowing. The sympathetic supply originates from the fifth to 12th thoracic spinal segments and is mainly distributed via the greater and lesser splanchnic nerves and the coeliac plexus.

STOMACH

ANATOMY

Divisions

The stomach originates as a dilatation in the tubular embryonic foregut during the fifth week of gestation. By the seventh week, it assumes its normal anatomic shape and position by descent, rotation, and further dilatation, along with disproportionate elongation of the greater curvature. After birth, the stomach is easily recognizable as the pear-shaped, most proximal abdominal organ of the alimentary tract. The stomach is divided into four anatomic regions, and although these divisions are useful to the surgeon when describing anatomic resections, they do not necessarily denote histologic or physiologic division of the organ. The region of the stomach that attaches to the esophagus is called the cardia. Proximal to the cardia is the physiologically competent lower esophageal sphincter. The pylorus connects the distal stomach (antrum) to the proximal duodenum. Although the stomach is fixed at the

gastroesophageal junction (GEJ) and the pylorus, the large midportion is mobile. The superior-most part of the stomach is the floppy, distensible fundus. It is bounded superiorly by the diaphragm and laterally by the spleen. The largest portion of the stomach is the body (corpus). The body contains the bulk of the gastric parietal cells and is bounded on the right by the relatively straight lesser curvature and on the left by the longer greater curvature. At the angularis incisura, the lesser curvature abruptly angles to the right. This point marks the end of the body and the beginning of the antrum, which extends to the pylorus. Another important anatomic angle (angle of His) is the one that the fundus forms with the left margin of the esophagus.

Anatomic Relationships

Most of the stomach is in the left upper quadrant of the abdomen. The GEJ is normally about 2 to 3 cm below the diaphragmatic esophageal hiatus in the horizontal plane of the seventh chondrosternal articulation, a plane only slightly cephalad to that containing the pylorus. The left lateral segment

of the liver usually covers a large portion of the stomach anteriorly. The remainder is bounded by the diaphragm, chest, and abdominal wall.

The relationship of the stomach to other intra-abdominal organs has important implications in disease. Adjacent organs include the pancreas and liver, which lie dorsal and ventral, as well as the spleen, which lies immediately to the left of the greater curvature. Inflammation of the pancreas may interfere with gastric emptying, whereas enlargement by neoplasm may cause an increased sensation of satiety or even obstruction of the gastric outlet. The transverse colon lies caudal and may interfere with function as a result of neoplastic invasion. The stomach itself may affect adjacent organs via perforation from peptic ulceration. Additionally, another closely related structure is the biliary tree, which runs posterior to the first portion of the duodenum, within centimeters of the gastric outlet, and can be injured during gastrectomy.

The stomach is anchored within the abdominal cavity to adjacent organs via a variety of flexible attachments known as ligaments. The gastrocolic ligament connects the greater curvature of the stomach and the transverse colon and runs along with the greater omentum, which hangs freely in the peritoneal cavity from the transverse colon. The lesser omentum is a double layer of peritoneum extending from the porta hepatis of the liver to the lesser curvature of the stomach and the first portion of the duodenum. The lesser omentum forms the anterior wall of the lesser sac and makes up the hepatogastric and hepatoduodenal ligaments; it contains the left and right gastric vessels, and its right free margin contains the hepatic artery, bile duct, and portal vein. The hepatogastric ligament attaches the stomach to the liver along the lesser curvature. The gastrosplenic ligament extends from the left portion of the greater curvature of the stomach to the hilum of the spleen and contains the short gastric vessels and the left gastroepiploic

vessels. Finally, the gastrophrenic ligament runs from the upper portion of the greater curvature to the diaphragm.

Blood Supply

The stomach derives the bulk of its blood supply from the celiac axis through four arteries: the left and right gastric arteries running along and supplying the lesser curvature and the left and right gastroepiploic arteries running along and supplying the greater curvature. A substantial quantity of blood may be supplied to the proximal part of the stomach by the inferior phrenic arteries and by the vasa brevia (short gastric arteries) from the spleen. The left gastric artery is the largest artery to the stomach. It originates from the celiac axis, generally courses cephalad and left, runs toward the gastric cardia, and gives off esophageal and hepatic branches before turning to the right and coursing along the lesser curvature of the stomach and the lesser omentum. It is also not uncommon (15% to 20%) for an aberrant left hepatic artery to originate from the left gastric artery. Occasionally, this vessel represents the only arterial flow to the

left hepatic lobe. Proximal ligation of the left gastric artery, under these circumstances, could therefore result in acute left-sided hepatic ischemia. The right gastric artery arises from the hepatic artery but may occasionally come from the gastroduodenal artery. The right gastroepiploic artery provides blood supply to the wall of the greater curvature of the stomach, as well as the greater omentum, and originates from the gastroduodenal artery behind the pyloric channel. It usually runs along the greater curvature of the stomach and terminates in an anastomosis with the left gastroepiploic artery, which originates from the splenic artery. The anastomotic connection between these major vessels ensures that in most cases the stomach will survive if three of four arteries are ligated, provided that the arcades along the lesser and greater curvatures are not disturbed, an important surgical consideration in patients undergoing gastric resection. Generally, the veins of the stomach parallel the arteries. The left gastric (coronary) and right gastric veins usually drain to the portal vein. The right gastroepiploic vein

drains into the superior mesenteric vein (a useful anatomic landmark), whereas the left gastroepiploic vein drains into the splenic vein.

Lymphatic Drainage

The lymphatic drainage of the stomach usually parallels the vasculature. The cardia and medial half of the body drain to the left gastric nodes. The lesser curvature sides of the distal antrum and pylorus drain to the right gastric nodes. The greater curvature half of the distal 60% of the stomach drains into the right gastroepiploic nodal chain, whereas the proximal greater curvature drains into the left gastroepiploic chain. These four groups of nodes all drain to the celiac group, from which lymph drains into the thoracic duct. Although intraoperative and postmortem studies appear to corroborate this scheme of lymph drainage, it is widely recognized that a gastric cancer anywhere in the stomach may metastasize to any of the four nodal groups. The rich submucosal plexus of lymphatics accounts for the fact

that there is often microscopic evidence of malignant cells several centimeters from the resection margin of gross disease. The anatomy of the lymph drainage of the stomach has received renewed interest as reports suggest that there may be improved survival with extended lymph node dissection in patients undergoing gastrectomy for primary gastric cancer, although this comes at a cost of increased morbidity with the more extensive procedure except when performed in high-volume centers. Definitive randomized controlled trials are ongoing to determine the purported survival advantage.

Innervation

The vagus nerves provide the extrinsic parasympathetic innervations to the stomach, and acetylcholine is the most important neurotransmitter. From the vagal nucleus in the floor of the fourth cerebral ventricle, the vagus traverses the neck in the carotid sheath and enters the mediastinum, where it gives off the recurrent laryngeal nerve and divides into several branches

around the esophagus. These branches come together again above the esophageal hiatus and form the *l*eft (*a*nterior) and *ri*ght (*p*osterior) vagal trunks (mnemonic LARP). Near the GE junction the anterior vagus sends a branch (or branches) to the liver in the gastrohepatic ligament, and continues along the lesser curvature as the anterior nerve of Latarjet . Similarly, the posterior vagus sends branches to the celiac plexus and continues along the posterior lesser curvature. The nerves of Latarjet send segmental branches to the body of the stomach before they terminate near the angularis incisura as the "crow's foot," sending branches to the antropyloric region. There may be additional branches to the distal stomach and pylorus that travel near the right gastric and/or gastroepiploic arteries. In 50% of patients, there are more than two vagal nerves at the esophageal hiatus.The branch that the posterior vagus sends to the posterior fundus is termed the *criminal nerve of Grassi*. This branch typically arises above the esophageal hiatus and is easily missed during truncal or highly selective vagotomy (HSV). Vagal fibers

originatingin the brain synapse with neurons in Auerbach's myentericplexus and Meissner's submucosal plexus. In the stomach the vagus nerves affect secretion (including acid), motor function,and mucosal bloodflow and cytoprotection. They also play a role in appetite control and perhaps even mucosal immunity and inflammation. Most of the axons contained in the vagal trunks are afferent (i.e., carrying stimuli from the viscera to the brain).

The extrinsic sympathetic nerve supply to the stomach originates at spinal levels T5 through T10 and travels in the splanchnic nerves to the celiac ganglion. Postganglionic sympathetic nerves then travel from the celiac ganglion to the stomach along the blood vessels.

Neurons in the myenteric and submucosal plexuses constitute the intrinsic nervous system of the stomach. There may be more intrinsic gastric neurons than extrinsic neurons, but their function is poorly understood.

It is obviously an oversimplification (and incorrect) to think exclusively of the vagus as the cholinergic system and the sympathetic system as the adrenergic system of innervation.

Although acetylcholine is an important neurotransmitter mediating vagal function, and epinephrine is important in the sympathetic nerves, both systems (as well as the intrinsic neurons) have various and diverse neurotransmitters, including cholinergic, adrenergic, and peptidergic (e.g., substance P and somatostatin).

MICROSTRUCTURE

The gastric wall consists of the major layers found elsewhere in the gut, i.e. mucosa, submucosa, muscularis externa and serosa, together with gastric vessels and nerves . The microstructure reflects the functions of the stomach as an expandable muscular sac lined by secretory epithelium, although there are local structural and functional variations in this pattern.

Mucosa

The mucosa is a thick layer with a soft, smooth surface that is mostly reddish brown in life but pink in the pyloric region. In the contracted stomach the mucosa is folded into numerous folds or rugae, most of which are longitudinal. They are most marked towards the pyloric end and along the greater curvature. The rugae represent large folds in the submucosal connective tissue (see below) rather than variations in the thickness of the mucosa covering them, and they are obliterated when the stomach is distended. As elsewhere in the gut, the mucosa is composed of a surface epithelium, lamina propria and muscularis mucosae.

Epithelium

When viewed microscopically at low magnification, the internal surface of the stomach wall appears honeycombed by small, irregular gastric pits approximately 0.2 mm in diameter. The base of each gastric pit receives several long, tubular gastric

glands that extend deep into the lamina propria as far as the muscularis mucosae. Simple columnar mucus-secreting epithelium covers the entire luminal surface including the gastric pits, and is composed of a continuous layer of surface mucous cells which release gastric mucus from their apical surfaces to form a thick protective, lubricant layer over the gastric lining. This epithelium commences abruptly at the cardiac orifice, where there is a sudden transition from oesophageal stratified squamous epithelium.

Gastric glands

Although all gastric glands are tubular, they vary in form and cellular composition in different parts of the stomach. They can be divided into three groups – cardiac, principal and pyloric. The most highly specialized are the principal glands.

Principal gastric glands

The principal glands are found in the body and fundus, three to seven opening into each gastric pit. Their junction with

the base of the pit is the isthmus, immediately basal to this is the neck, and the remainder is the base. The walls of the gland contain at least five distinct cell types: chief, parietal, mucous neck, stem and neuroendocrine.

Chief (peptic) cell are the source of the digestive enzymes pepsin and lipase. They are usually basal in position and cuboidal in shape, and their nuclei are rounded and euchromatic. They contain secretory zymogen granules and their abundant cytoplasmic RNA renders them strongly basophilic. Parietal (oxyntic) cells are the source of gastric acid and of intrinsic factor, a glycoprotein necessary for the absorption of vitamin B_{12}. They are large, oval and strongly eosinophilic, and have centrally placed nuclei. Parietal cells occur intermittently along the walls of the more apical half of the gland, but can reach as far as the isthmus; they bulge laterally into the surrounding connective tissue. They have a unique ultrastructure related to their ability to secrete hydrochloric acid. The luminal side of the cell is deeply invaginated to form a series of blind-ended

channels (canaliculi) that bear numerous irregular microvilli covered by a plasma membrane rich in H^+/K^+ ATPase antiporter channels. The latter actively secrete hydrogen ions into the lumen; chloride ions follow along the electrochemical gradient. The mitochondria-rich cytoplasm facing these channels contains a tubulo-vesicular system of abundant fine membranous tubules directed towards the canalicular surface. The precise structure of the cell varies with its secretory phase: when stimulated, the number and surface area of the microvilli increases up to five-fold, probably as a result of the rapid fusion of the tubulo-vesicular system with the plasma membrane. This process is reversed at the end of stimulated secretion, when the excess membrane retreats back into the tubulo-alveolar system and microvilli are lost.

Mucous neck cells are numerous at the necks of the glands and are scattered along the walls of the more basal regions. They are typical mucus-secreting cells, displaying apical secretory vesicles containing mucins, and basally displaced nuclei: their

products are distinct histochemically from those of the superficial mucous cells.

Stem cells are relatively undifferentiated mitotic cells from which the other types of gland cell are derived. They are relatively few in number, and are situated in the isthmus of the gland and the bases of the gastric pits. Stem cells are columnar and possess a few short apical microvilli. They periodically undergo mitosis; their progeny migrate either apically, to differentiate into new surface mucous cells, or basally, to form mucous neck, parietal, chief or neuroendocrine cells. All of these cells have a limited lifespan, especially the mucus-secreting types, and so they are constantly replaced. The typical replacement period for surface mucous cells is 3 days, and for mucous neck cells is 1 week. Other cell types appear to live much longer.

Neuroendocrine (enteroendocrine) cells occur in all types of gastric gland, but more frequently in the body and fundus of

the stomach. They are situated mainly in the deeper parts of the glands, among the chief cells. They are basally situated, pleomorphic cells and display irregular nuclei surrounded by granular cytoplasm that contains clusters of large (0.3 μm) secretory granules. Neuroendocrine cells synthesize a number of biogenic amines and polypeptides that are important in the control of gut motility and glandular secretion. They are part of the system of dispersed neuroendocrine cells: in the stomach they include G cells, which secrete gastrin; D cells, which secrete somatostatin; and ECL (enterochromaffin-like) cells, which secrete histamine.

Cardiac glands

Cardiac glands are confined to a small area near the cardiac orifice: some are simple tubular glands, others are compound branched tubular. Mucus-secreting cells predominate; parietal and chief cells are present, but sparse.

Pyloric glands

Pyloric glands empty via groups of two or three short convoluted tubes into the bases of the deep gastric pits of the pyloric antrum: the pits occupy about two-thirds of the mucosal depth .The glands are populated mainly by mucus-secreting cells, but they also contain neuroendocrine cells, especially G cells, which secrete gastrin when activated by appropriate mechanical stimulation (causing increased gastric motility and secretion of gastric juices). Although parietal and chief cells are scarce, parietal cells are always present in both fetal and postnatal pyloric glands, and may also appear in the duodenal mucosa, proximally nea Lamina propria

The lamina propria forms a connective tissue framework between the glands. It contains small masses of lymphoid tissue, gastric lymphatic follicles, which resemble solitary intestinal follicles (especially in early life). It also contains a complex periglandular vascular plexus involved in the maintenance of the

mucosal environment, e.g. the removal of bicarbonate produced in the tissues as a counterpart to acid secretion, and neural plexuses rich in both sensory and motor terminals.

Muscularis mucosae

The muscularis mucosae is a thin layer of smooth muscle fibres lying external to the layer of glands, arranged as continuous inner circular and outer longitudinal layers, and a discontinuous external circular layer. The inner layer sends strands of smooth muscle cells between the glands: their contraction probably assists in emptying into the gastric pits.

Submucosa

The submucosa is a variable layer of loose connective tissue. It contains thick bundles of collagen, numerous elastin fibres, blood vessels and nervous plexuses, including the ganglionated submucosal (Meissner's) plexus.

Muscularis externa

The muscularis externa is a thick muscle coat immediately under the serosa, with which it is closely connected by subserous loose connective tissue. From innermost outwards, it contains oblique, circular and longitudinal layers of smooth muscle fibres. The layers are not always easily separated: the circular layer is poorly developed in the oesophageal region, but is thickened at the distal pyloric antrum to form the anular pyloric sphincter; the outer longitudinal layer is most pronounced in the upper two-thirds of the stomach; the inner oblique layer is most obvious in the lower half.

The actions of the muscularis externa of the stomach produce a churning movement that mixes food with the gastric secretions. When the muscles contract, they reduce the volume of the stomach and throw the mucosa into longitudinal folds or rugae . The folds flatten as the stomach distends with food and the musculature relaxes and thins. Muscle activity is controlled

by a network of unmyelinated autonomic nerve fibres and their ganglia which lie between the muscle layers in the myenteric (Auerbach's) plexus.

Serosa or visceral peritoneum

The serosa is an extension of the visceral peritoneum. It covers the entire surface of the stomach other than along the attachments of the greater and lesser omenta to the greater and lesser curvatures respectively, where the peritoneal layers are separated by vessels and nerves, and over a small posteroinferior area near the cardiac orifice, where the stomach contacts the diaphragm at the reflections of the gastrophrenic and left gastropancreatic folds.

DUODENUM

The adult duodenum is 20–25 cm long and is the shortest, widest and most predictably placed part of the small intestine. It is only partially covered by peritoneum, although the extent of the peritoneal covering varies along its length: the proximal 2.5

cm is intraperitoneal, and the remainder is retroperitoneal. The duodenum forms an elongated ‘C' that lies between the level of the first and third lumbar vertebrae in the supine position. The lower ‘limb' of the C extends further to the left of the midline than the upper limb. The head and uncinate process of the pancreas lie within the concavity of the duodenum which is ‘draped' over the prominence formed from the lumbar spine, the duodenum therefore bends in an antero-posterior direction as well as following the form of a ‘C'. The duodenum lies entirely above the level of the umbilicus and is described as having four parts .

FIRST (SUPERIOR) PART

The first, and most mobile, part of the duodenum is about 5 cm long. It starts as a continuation of the duodenal end of the pylorus and ends at the superior duodenal flexure. Peritoneum covers the anterior and superior part of its posterior aspect close to the pylorus, where the duodenum forms part of the anterior

wall of the epiploic foramen. Here the lesser omentum is attached to its upper border and the greater omentum to its lower border. The first 2 or 3 cm have a bland internal mucosal appearance and readily distend on insufflation during endoscopy. This part is frequently referred to as the duodenal ‘cap'. It has a triangular, homogeneous appearance during contrast radiology, shows the same pattern of internal rugae as the pylorus, and is often visible on plain radiographs of the abdomen as an isolated triangular gas shadow to the right of the first or second lumbar vertebra. The duodenum next passes superiorly, posteriorly and laterally for 5 cm before curving sharply inferiorly into the superior duodenal flexure: it rapidly becomes more retroperitoneal during this part of its course, until peritoneum only covers its anterior aspect. From the end of the duodenal cap, its internal appearance is characterized by extensive, deep mucosal folds that involve up to half of the circumference of the lumen. Even during endoscopic insufflation, these folds are pronounced and they are readily

seen on contrast radiographs. The section from the duodenal cap to the superior duodenal flexure lies posterior and inferior to the quadrate lobe of the liver. The first part of the duodenum lies anterior to the gastroduodenal artery, common bile duct and portal vein and anterosuperior to the head and neck of the pancreas. It is posterior to the neck of the gallbladder. The gastroduodenal artery lies immediately posterior to the posterior wall of the duodenum: penetrating peptic ulceration in the posterior wall and subsequent erosion of the gastroduodenal artery may lead to dramatic haemorrhage. Penetrating peptic ulceration in the anterior wall may lead to free perforation into the peritoneal cavity because the anterior surface of the first part is covered only by peritoneum.

The common hepatic and hepatoduodenal lymph nodes lie close to the first part of the duodenum and can be visualized using endoscopic ultrasound. This may be important in the staging of gastric, pancreatic or bile duct tumours. The proximity of the common bile duct to the first part of the

duodenum allows endoscopic ultrasound examination of the distal common bile duct and the formation of a surgical anastomosis between bile duct and duodenum (choledochoduodenostomy) when required.

The junction of the first and second parts of the duodenum lies posterior to the neck of the gallbladder.

SECOND (DESCENDING) PART

The second part of the duodenum is 8–10 cm long. It starts at the superior duodenal flexure and runs inferiorly in a gentle curve, convex to the right side of the vertebral column and extending to the lower border of the third lumbar vertebral body. It then turns sharply medially into the inferior duodenal flexure which marks its junction with the third part of the duodenum. It is covered by peritoneum only on its upper anterior surface, lies posterior to the neck of the gallbladder and the right lobe of the liver at its start, and is crossed anteriorly by the transverse colon. The medial end of the gastrocolic omentum and the

origin of the transverse mesocolon are attached to the anterior surface of the duodenum by loose connective tissue. Below the attachment of the transverse mesocolon, the connective tissue and vessels forming the mesentery of the upper ascending colon and hepatic flexure are loosely attached to its anterior surface. This section of duodenum is at risk of injury during surgical mobilization of the ascending colon.

The second part lies anterior to the hilum of the right kidney, the right renal vessels, the edge of the inferior vena cava and the right psoas major. The head of the pancreas and the common bile duct are medial and the hepatic flexure is above and lateral. A small part of the pancreatic head is sometimes embedded in the medial duodenal wall, and pancreatic ‘rests' in the duodenal wall may produce small filling defects on contrast radiology. The internal appearance is similar to that of the distal portion of the first part of the duodenum, with pronounced mucosal folds . The common bile duct and pancreatic duct enter the medial wall obliquely and usually unite to form the common

hepatopancreatic ampulla. The narrow distal end opens on the summit of the major duodenal papilla (ampulla of Vater), which is situated on the posteromedial wall of the second part, 8–10 cm distal to the pylorus. There are variants of the ductal anatomy. The most common is a second, accessory pancreatic duct which may open 2 cm above the major papilla on a minor duodenal papilla. Peptic ulceration of the second part of the duodenum is less common than that of the first part, and tends to occur on the anterior or lateral wall.

ENDOSCOPY

Indications

1. Common indications for diagnostic endoscopy include evaluation of 1.Pain that persists despite medical therapy,
2. Evaluation of symptoms in the postoperative stomach,
3. Assessment of hematemesis or GI bleeding from a suspected upper GI source,
4. Evaluation of an abnormal radiographic study, or

5. Follow-up for previously biopsied gastric ulcers.
6. Other indications requiring upper endoscopy for evaluation of the esophagus include long-standing reflux disease, dysphagia, odynophagia, or work-up of identified cervical lymph node metastasis.
7. Anatomic abnormalities of the stomach such as paraesophageal hernias, volvulus, or outlet obstruction can also be evaluated endoscopically.
8. Finally, diagnostic esophagogastroduodenoscopy (EGD) may be used for sampling of gastric/jejunal tissue or fluid, surveillance of patients with familial adenomatous polyposis, or follow-up for symptoms of suspected organic disease and weight loss.

Indications for therapeutic endoscopy of the stomach include

1.Treatment of bleeding,

2.Dilation of gastric outlet obstruction, and

3.Resection of gastric tumors by either polypectomy or endoscopic mucosal resection.

4.Laparoscopic-assisted therapeutic endoscopy has also been used for the management of GI stromal tumors.

In addition, future technologies of transgastric intra-abdominal surgery are being developed for the management of appendicitis, cholecystitis, and alimentary tract obstruction.

EGD is not indicated in patients with chronic, nonprogressive, and atypical symptoms without evidence of organic disease.

It is also not indicated in patients with metastatic adenocarcinoma of an unknown primary when identification of the primary tumor will not result in alteration of management.

EGD is contraindicated when the risk to the patient outweighs the most likely expected benefit of the procedure,

when adequate patient cooperation cannot be achieved, or if a perforated viscus is already known or suspected.

Endoscopic Instrumentation and Patient Preparation

Flexible endoscopes initially contained fiberoptic bundles for transmission of light to the tip of the scope and return of a real image back to the endoscopist's eye. With advancement in video monitors and computer processors, flexible endoscopes now use fiberoptics only for transmission of light, and the image is transmitted via a CCD (charge-coupled device) computer chip at the tip of the endoscope. Similar to laparoscopy, multiple observers and assistants can observe a similar image, thereby permitting enhanced assistance when performing advanced therapeutic procedures. It also provides better opportunities for education.

Flexible endoscopes with smaller outer diameters and larger biopsy channels have resulted in better patient tolerance and comfort and the performance of complex interventions.

Double-channel endoscopes allow “two-handed techniques” such as mucosal resection and tissue approximation in the absence of more effective endoscopic suturing devices. Early prototypes of robotic arms placed on the outside of the endoscope have been used in an animal model and are hoped to some day solve the limitations of present instrumentation in performing advanced transgastric intra-abdominal procedures.

Preparation for diagnostic and therapeutic endoscopy of the stomach requires merely 6 to 8 hours of fasting before the procedure. Patients with gastric outlet obstruction or profound gastroparesis require a longer period of fasting, and tube decompression before the procedure may be prudent. Fasting before the procedure may not be feasible in emergency situations such as GI bleeding, caustic ingestion, or foreign body removal. In these situations, one may consider the use of general anesthesia and endotracheal intubation to protect the airway and prevent aspiration. Otherwise, in the majority of cases, conscious sedation with the combination of a narcotic and a

benzodiazepine delivered intravenously and titrated slowly is used to achieve acceptable patient sedation and comfort.

Delivery of conscious sedation requires adequate monitoring with pulse oximetry, blood pressure recordings, and regular documentation of respiration. In patients with extensive upper GI bleeding, placement of a large-bore orogastric tube is necessary for saline lavage to clear clots and old blood. Whether cold or warm water should be used has been debated, without identification of actual clinical benefit from one or the other. It should be noted that lavage of ice water may lead to hypothermia in patients with massive GI hemorrhage, possibly accentuating a coagulopathic state.

After delivery of conscious sedation and placement of the patient in the left lateral decubitus position, the endoscope is passed under direct visualization into the esophagus. Inspection of the vocal cords is important to rule out polyps or upper airway obstruction. The endoscope is advanced posterior to the

arytenoid processes, and with careful pressure and instillation of air, the endoscope is passed beyond the upper esophageal sphincter into the cervical esophagus under direct visualization. Asking the patient to swallow, as well as placing the head in a flexed position, may assist in this portion of the procedure. The endoscope is then advanced with direct view of the lumen at all times. The esophagus can be somewhat tortuous in older patients, and the endoscopist must be aware that anatomic changes such as cervical ribs or an esophageal diverticulum may increase the risk for complications such as perforation.

The squamous mucosa of the esophagus is somewhat shiny and whitish in coloration. After advancement of the endoscope into the stomach, air is insufflated to distend the stomach. As the endoscope advances into the stomach, it assumes a “greater curve position,” with the posterior wall at 3 o'clock, the greater curvature at 6 o'clock, the anterior wall at 9 o'clock, and the lesser curvature in the 12-o'clock position. When the scope is initially advanced into the stomach, rugal

folds are identified in the fundus and body and are typically absent at the junction of the distal body and antrum. As the scope is advanced further, the pylorus comes into view and appears round, but it may have different contours as a result of associated inflammatory diseases . By continuing to look upward beyond the pylorus, a retroflex view will be obtained with visualization of the incisura and fundus of the stomach. Withdrawing the endoscope at this time results in paradoxical movement and allows complete circumferential visualization of the fundus and cardia. Full evaluation should be performed and the fundic pool should be aspirated to allow completion of this endoscopic evaluation. Evaluation of the angularis is important to rule out type I gastric ulcers. The endoscope should then be advanced through the pylorus into the pyloric channel with assessment of all surfaces circumferentially to rule out duodenal ulcers. Advancement of the scope into the second portion of the duodenum is possible by merely looking up and to the right and trolling back on the endoscope. This maneuver places the scope

in what is called a “lesser curve” or “short” position and provides paradoxical advancement of the endoscope further down into the second and third portions of the duodenum. With a forward-viewing scope, visualization of the ampullary complex may be somewhat difficult, but it may be seen at the 9-o'clock position. A side-viewing endoscope is necessary to obtain a full endoscopic view of this portion of the duodenum. The endoscope can then be withdrawn back into the stomach, and the luminal surfaces should again be reinspected for any abnormalities. The stomach is quite full at this juncture and should be evacuated of air before withdrawing the endoscope. If the vocal cords had not been inspected on intubation, they should be inspected during withdrawal of the endoscope. At completion of the procedure, patients are observed during resolution of the conscious sedation, and a clear liquid diet is started. Usually within 30 to 60 minutes patients should be stable for discharge from the endoscopy unit.

The endoscopist who examines the esophagus evaluates a muscular tube whose primary function is to convey swallowed material from the mouth to the stomach. The esophagus is approximately 25 cm in length measured from its origin in the neck just below the cricoid cartilage (C6 level, approximately 15 cm from the incisor teeth as measured by the endoscopist) to its termination in the abdomen at the gastric cardia (T10-T11 level, approximately 40 cm from the incisor teeth).[1] Proximally, the upper esophageal sphincter (UES) separates the pharynx from the esophagus. The UES extends approximately 3 cm in length and comprises three skeletal muscle groups, including the distal portion of the inferior pharyngeal constrictor, the cricopharyngeus, and the circular muscle of the proximal esophagus.[2] Introduction of the endoscope into the UES often causes gagging, and the muscles relax only briefly during a swallow. Consequently, the endoscope is typically passed quickly through the UES, and endoscopic visualization of its mucosal lining is frequently limited.

The esophagus passes from the chest into the abdomen through the diaphragmatic hiatus, a canal-shaped opening in the right crus of the diaphragm. Approximately 2 cm of the distal end of the esophagus normally lies within the abdomen. The lower esophageal sphincter (LES) comprises both the skeletal muscle of the crural diaphragm (external LES muscle) and the circular smooth muscle of the distal esophagus itself (internal LES muscle), although endoscopists often refer only to the latter when describing the LES. Unlike the UES, endoscopic examination of the LES region is not generally limited either by sustained sphincter muscle contraction or by patient discomfort.

The esophageal lumen is collapsed at rest and must be distended with air during endoscopy so that the stratified squamous epithelial lining can be visualized well. When so distended, the squamous epithelium appears pale, glossy, and relatively featureless. Within the chest at about the T4 level, the esophagus is indented on its left side by the aortic arch. This pulsating indentation can be noted during endoscopic

examination at a distance of approximately 23 cm from the incisor teeth. Just below the arch at approximately 25 cm, the left main bronchus causes a subtle indentation on the left anterior aspect of the esophagus . Below the bronchus, the esophagus abuts the left atrium. The heart normally causes no prominent indentation of the esophageal lumen, but atrial pulsations can often be visualized at a level approximately 30 cm from the incisor teeth.

The gastroesophageal junction (GEJ) is the level at which the esophagus ends and the stomach begins. Unfortunately, there are no universally accepted landmarks that clearly delimit the distal end of the esophagus and the proximal part of the stomach, and the GEJ has been defined differently by anatomists, radiologists, physiologists, and endoscopists. Landmarks suggested by anatomists, such as the peritoneal reflection or the character of the muscle bundles in the esophageal wall, are not useful for endoscopists. Radiologists refer to the region of the GEJ as the vestibule, and they seldom

attempt to localize the precise point at which the esophagus joins the stomach.Physiologists have used the distal border of the LES (determined manometrically) to define the GEJ, but it is difficult to identify this border precisely by endoscopic techniques. Indeed, one study has shown that manometric and endoscopic localization of the LES often differs by several centimeters.

When considering any proposed landmark for the GEJ, it is important to appreciate that there is no clear-cut “gold standard” for the structure and, consequently, all of the suggested landmarks can be considered arbitrary. Furthermore, for most disorders of the esophagus and stomach that are diagnosed endoscopically, it is not important that the GEJ be identified with great precision. For some disorders, most notably Barrett's esophagus, for which the endoscopist must determine the extent of esophageal columnar lining, precise localization of the GEJ can be critical for establishing the diagnosis.

Suggested endoscopic criteria for the GEJ include the level at which the tubular esophagus flares to become the sack-like stomach, the proximal margin of the gastric folds when the esophagus and stomach are partially distended, and the distal end of the esophageal palisade vessels. Although these landmarks may be readily recognized in still photographs of the junction region, the distal esophagus in vivo is a dynamic structure whose appearance changes from moment to moment. The location of the point of flare changes with respiratory and peristaltic activity. The proximal gastric folds can prolapse transiently up into the esophagus. The appearance of the junction region also varies with the degree of distention of the esophagus and stomach, and the palisade vessels can be difficult to identify with conventional endoscopes.

The proximal extent of the gastric folds is the landmark for the GEJ used frequently by Western endoscopists. This landmark was proposed by McClave et al. in 1987 based on their endoscopic observations in only four subjects who were

identified as normal controls because they had “no clinical evidence of esophageal disease.” The junction between squamous and columnar epithelia (the SCJ) was located within 2 cm of the gastric folds in all of these four subjects, and thus the authors concluded that the diagnosis of columnar-lined esophagus should be considered only when the SCJ is located more than 2 cm above the GEJ (i.e., the proximal level of the gastric folds). This study can be criticized both for the small number of control subjects and for the lack of documentation that the four controls were indeed normal. Esophageal pH monitoring studies were not performed, and therefore it is not clear that the control subjects had normal esophageal acid exposure. Biopsy specimens of the columnar-lined esophagus were not taken, and thus short-segment Barrett's esophagus was not excluded . Furthermore, three of the four control subjects had hiatal hernias and one had reflux esophagitis. It seems surprising that a proposed landmark based on such questionable data has been so widely accepted by endoscopists.

ESOPHAGEAL CANCER

Esophageal cancers that are recognizable by conventional endoscopy appear as masses that protrude into the lumen of the esophagus. The masses are often nodular, irregular, and ulcerated, and the tumors may have a different color and texture than the surrounding normal mucosa. Squamous cell carcinoma and adenocarcinoma of the esophagus cannot be differentiated on the basis of endoscopic appearance, but the location of the tumor and its associated features may provide important clues regarding its histology. Tumors that involve the proximal and middle portions of the esophagus and that are separated from the stomach by a segment of squamous epithelium are very likely to be squamous cell carcinomas. Distal esophageal tumors can be either squamous cell carcinomas or adenocarcinomas. If there is associated Barrett's esophagus, the tumor is likely to be an adenocarcinoma. However, adenocarcinomas that cause symptoms have often grown so large that they have obliterated any evidence of the Barrett's esophagus that spawned them. It

can be especially difficult to determine the origin of an adenocarcinoma that straddles the GEJ. Such tumors can arise either from Barrett's esophagus or from the proximal part of the stomach. If no Barrett's esophagus is apparent, investigators have relied on the location of the tumor epicenter to classify the tumor as esophageal or “cardiac.”

Tissue-Sampling Techniques

1.Biopsy and brushing techniques

By combining the various tissue biopsy techniques to the endoscopy visualisation ,the utility of the endoscopy is enhanced one step ahead.

In diagnosis of infections in the upper gastro intestinal tract is very difficult in past,but with the cytology of the tract by endoscopy is particularly useful for confirming the infections by bacterial,fungal and Helicobacter pylori infection.In upper gastrointestinal malignancy evaluation ,it can add a yield of 10% to endoscopic biopsy alone. Particularly in the malignancy of

upper gastrointestine brush cytology is very useful as sensitivity is around 80% to 90% and specificity is around 100% .

In case of touch cytology the standard biopsy samples itself is processed by rolling it in the slide and fixing it for the study.In evaluation of malignany and particularly the infections is the main advantage of this cytology. This technique can be used as an adjunct to the biopsy alone.

Standard biopsy techniques

In case of foregut malignancies the yield is maximum with standard biopsy as disease represents at the mucosal level.It yields a maximum results when targeted correctly. For *H. Pylori disease* evaluvation it the diagnostic yields as been shown to be comparable in all parts of the stomach.

A pediatric colonoscope can be used for the jejunal limbs,after gastrojejunostomy to enter in to the jejunal limbs.

Infected patients are being diagnosed by combining three biopsy samples,taken from the antrumpyloric region, near the incisura in lesser curvature and body of stomach greater curvature.

With malignant lesions,when the biopsy are taken from the rim of the ulcers and also from the base with number of biopsies being 8 to 10,the yield is maximum in diagnosis .the specimens retained in the endoscopy channel can be used for the brush cytology and salvage cytology.with these procedures malignancy can be diagnosed upto 100%

1.sheathed brush is passed through the endoscopic channel which is used for the brush cytology.

a. sheath is positioned near to the area to be examined and extend the brush.

b. cells in the brush can be dislodged by moving it vigorously to and fro .

c. to avoid sample loss while the thing being withdrawn through the endoscope biopsy channel,just retract the brush from the sheath.

d. the slides for the cytologic review is prepared with these samples.

e.Another method of contributing to the sample yield is washing the brush in balanced salt solution.

1. **Forceps biopsy** allows us to get adequate tissue (generally limited to the mucosa) for the diagnosis by histological examinations.

Different kinds of biopsy forceps are present,by choosing the proper forceps our intened sample can be obtained

2. Spiked forceps

In the single passage itself a chunk of multiple biopsies can be obtained by use this forceps as it is provided with multiple tiny projections. The endoscopist's ability to get tissue

that is oriented tangentially to the endoscope may be enhanced by helping the forceps to firmly engage the tissue to be sampled.

3.Large cupped forceps, or jumbo forceps

These forceps are very useful in taking large biopsies from the sites.it is usefull when only few attempts can be taken for a biopsy.for this large diameter endoscopes are needed for the passage of biopsy forceps.

4. **Endoscopic mucosal resection**

It is very useful technique in case of early malignancies and also when large areas are to be examined.it helps in the complete removal of suspicious areas.it can be combined with the endoscopic ultrasound when it can also serve as a therapeutic tool too.in high incident countries like japan it is very useful method.

a.hypertonic saline is used to elevate the lesion where the biopsy is targeted.it helps in raising the lesion and easy snaring of the lesion.

b. **standard snare technique** is used for this harvesting.

c. There are other techniques applied to the resection like where two small sized endoscopes are used for the biopsies.one endoscope is used to hold the specimen and another is used to cut the lesion from the base.

d.single cap fitted endoscope uses the suction force which withdraws the tissue after snaring

5. **Large-particle biopsy**

Standard biopsy techniques are not useful in taking the submucosal biopsies .this is replaced by this biopsy technique where it is amenable to take the submucousal tissue also.

Disadvantages

1.risk of bleeding

2.perforation

However it is replaced by the advancement in the endoscopic ultrasound guided biopsies and fnac for submucosal lesions.

Procedure

a. **Therapeutic, two-channel endoscope** is used .first snaring tube is passed in one channel.second a biopsy forceps is passed below it.

b. In the area to be sampled keep the snare on it and open the snare.

c.Through the snare biopsy forceps is passed down. Pick up and elevate both mucosa and submucosa, thus allowing the snare to incorporate a deeper level of tissue than would otherwise be possible.

5. **Chromoscopic techniques**

In situations of doubt whether there is a chance of malignancy and to cofirm after resection as there is a clearance are not.It is also helpfull in post operative setting to find the malignancy deposit .By using the staining and microscope we can find the dysplastic cells.

a. **Lugol's solution** (typically ≥20 mL of a 1–2% solution applied directly via an endoscopic catheter) stains glycogen-containing tissue, which is present in normal esophageal squamous mucosa.

Areas of intestinal metaplasia, carcinoma, and inflammation stain negatively with this agent and may thus be more apparent for biopsy sampling after its application.

b. **Methylene blue** is usually applied as a 0.5% to 1% solution in similar volume following application of a mucolytic agent, and is taken up selectively by absorptive epithelium, such as intestinal metaplasia.

F. Endoscopic Ultrasound

It has revolutionised the diagnostic technique in the gastro intestinal malignancies particularly in the upper digestive tract.This endoscopic ultrasound has main role in staging of disease which can be difficult by any other investigations. Its main applications are in

1.diagnosis and staging of gastrointestinal cancers

2.submucosal pathology and biopsy

3.common bile duct stones and also in pancreatic malignancies

EUS-guided fine-needle aspiration cytology

Its gaining more important in adjunct to the standard endoscopy .the yield in diagnosis is increased to 100% when it is combined with theaging is more accurat standard biopsy technique.it is more useful in

1.esophageal,pancreatic,gastric and even in pulmonary neoplasia

2.staging is more accurate as compared the radiological investigations as CT and MRI.

3.The submucosal lesions are easily diagnosed by this endoscopic usg as the lesions are difficult to find in the radiologically in early stages

The stromal tumors ,neuroendocrine tumors are easily identified and at the early stages with the use this endo usg .

Drawbacks

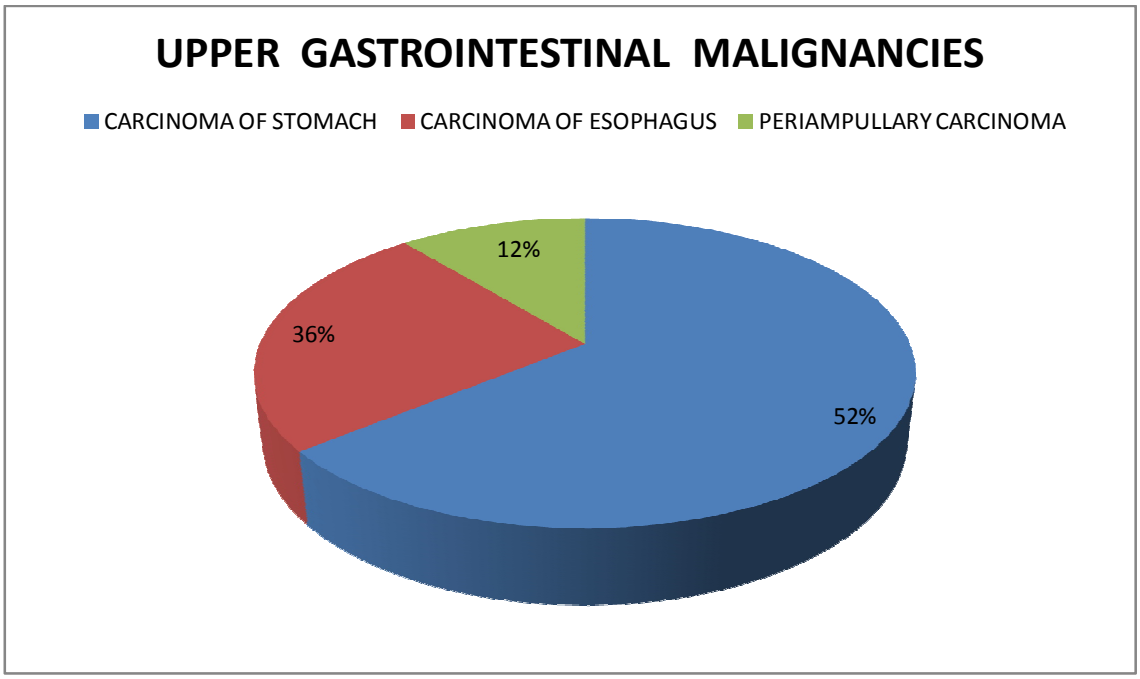
1.cost

2.long learning curve

RESULTS

UPPER GASTROINTESTINAL MALIGNANCIES

PARTS OF UPPER GI	NUMBER OF CASES
ESOPHAGHEAL CARCINOMA	18
GASTRIC CARCINOMA	26
PERIAMPULLARY CRCINOMA	6
TOTAL	50



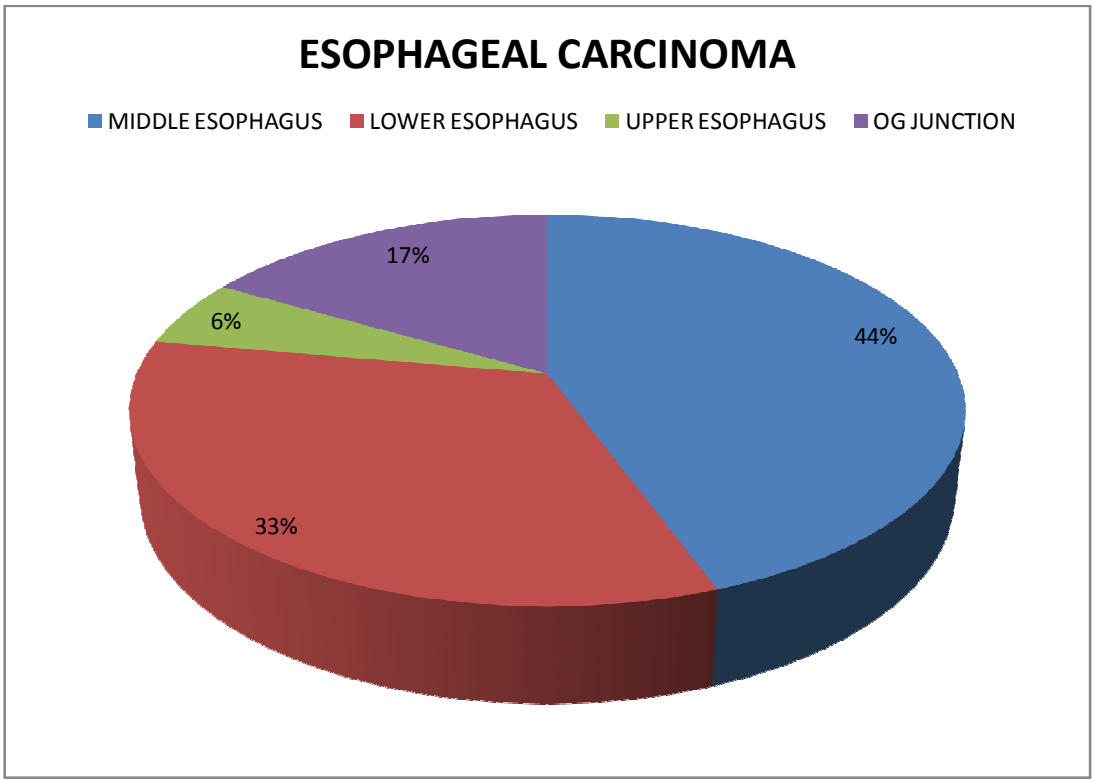
Upper gastro intestinal carcinomas are becoming increasingly common in Indian population accounting to the change in food habits and environmental changes occurring rapidly in the country.

Of patients whom i included in my study from the total of fifty patients half of the patients had gastric carcinoma,others comprising esophageal carcinoma and periampullary carcinoma.

There is a gradual increase in esophageal carcinoma incidence compared to the past incidence.periampullary carcinomas contribute to 12% of the total upper gastrointestinal malignancies.Gastric carcinomas account for the 52% of total malignancies in the upper gastrointestinal carcinomas.Esophageal carcinomas account for about 36% of carcinomas included in this study.

ESOPHAGEAL CARCINOMA

UPPER ESOPHAGUS	1
MIDDLE ESOPHAGUS	8
LOWER ESOPHAGUS	6
ESOPHAGOGASTRIC JUNCTION	3
TOTAL	18



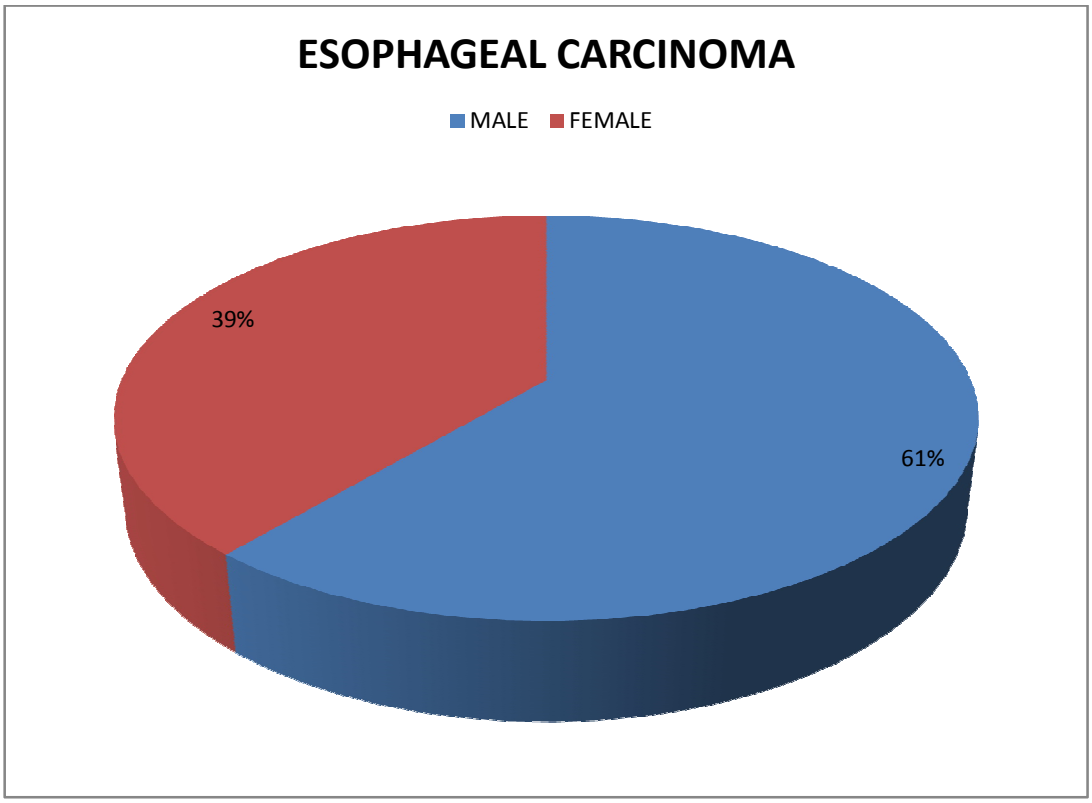
Esophageal carcinomas has increased rapidly in the western countries

in few decades .In the esophagus most common site of the malignancy is middle third of esophagus ,as it continues in this study also but there is aa alarming rise in the incidence of lower esophageal carcinomas.Its increase is greater than any other malignancy .Upper esophageal growth accounts for 6% of esophageal tumors which is the lowest and middle esophageal tumors accounts for maximum number with 44% of cases in this study.

Lower esophageal growth consists of 33% of tumors in this study .OG JUNCTION tumors are include in the separate entity and account for 17% of tumors in this study.proximal 5cm tumors of gastric is also included in the esophageal tumors only based on the new classification.Although the esophageal carcinomas are uncommon compared to other malignancies it is gaining importance due to advents in the endoscopic diagnosis and early interventional modalities .

SEX DISTRIBUTION IN ESOPHAGEAL CARCINOMA

MALE	11
FEMALE	7
TOTAL	18

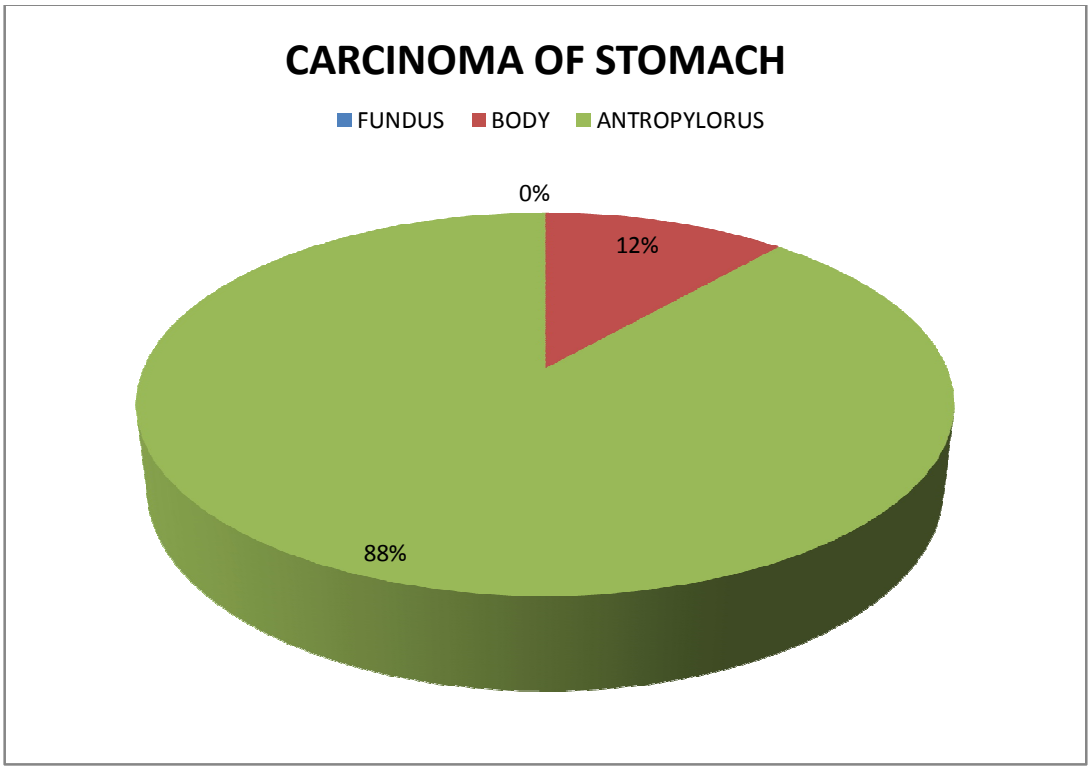


Sex distribution in the esophageal carcinomas is very important compared to other malignancies.Males are show a stricking predominance in esophageal carcinomas for a long time.In white males esophageal adenocarcinomas was double that of the Hispanics and fourfold higher than that of blacks ,Asians,and native Americans .In all races the incidence of esophageal carcinoma is very less compared to the male incidence of tumor.

Males have more incidence of sqamous cell cacinoms compared to females.In this study also incidence is more in the males compared to females.Males account for 61% of esophageal tumors and females consist of 39% of tumors.Adenocarcinomas of cardia incidence is low amomg the API males compared with white males,but it was higher compared with black males.However ethinic differences are important in the esophageal carcinoma ,because of increasing trend of adenocarcinoma of lower esophagus

GASTRIC CARCINOMA

SITE	NUMBER OF CASES
FUNDUS	0
BODY	3
ANTROPYLORUS	23
TOTAL	26



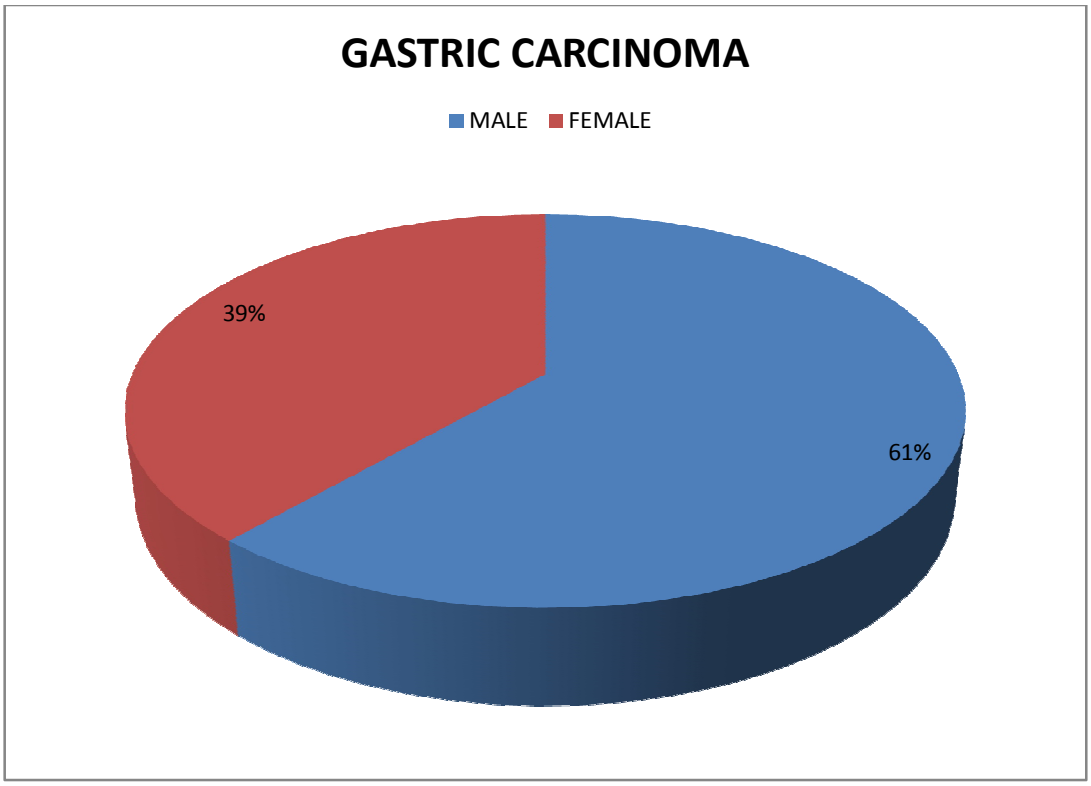
GASTRIC CARCINOMA

Tumor location in the stomach has a greater significance for the diagnosis,management and prognosis of the patient.proximal tumors stomach are more common in western world due to increased incidence of gastroesophageal reflux disease and obesity in western population.They account for more than half of the patients gastric cancer patients.

But the trend in the developing countries is totally different from western world incidence of gastric cancers.It corresponds to the incidence of Helicobacter pylori infection in the stomach.The type of tumor has also grater impact on the outcome of patients.Distal gastric tumors are common in the developing countries like India where we have the higher incidence of Helicobacter pylori infection which correlates to the higher incidence of tumor in distal stomach.The intestinal types are most common in the distal tumors of stomach as compared to the diffuse type in the proximal tumors .

SEX DISTRIBUTION IN GASTRIC CARCINOMA

MALE	16
FEMALE	10
TOTAL	26



SEX DISTRIBUTION IN GASTRIC CANCERS

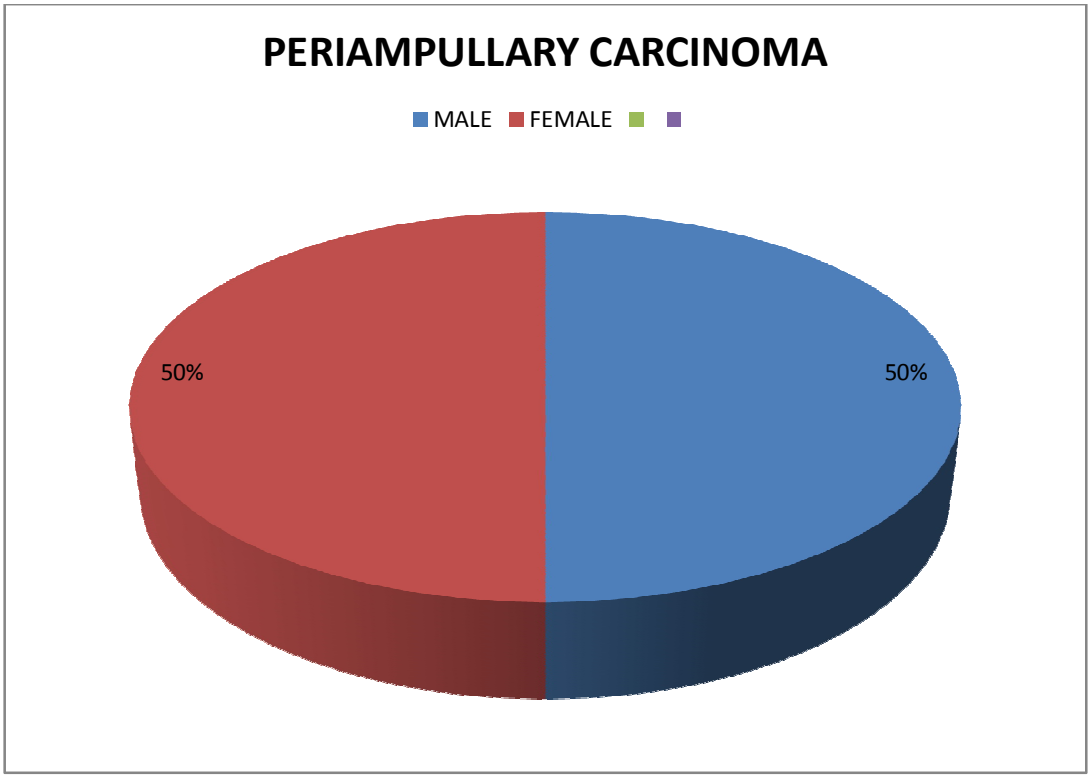
Sex distribution in gastric cancers is very important as the incidence of proximal tumors are increasingly rapidly in the world .Gastric cardia tumors are almost five times more common in males than females .Non cardia gastric tumors are also twice common in males as compared to females.

In western world the trend of increasing incidence of proximal tumors of stomach has implicated in the increasing trend of tumor in males. In the developing countries the distal stomach cancers are still predominating the proximal tumors.The incidence is more common in males as in other parts of the world with distal tumors being more common in our country.

In this study also we have incidence of gastric tumor more in males than females as in developing countries.Most of the tumors in males is distal tumors of stomach.However in females also there is increasing incidence of gastric cancers most of them with non cardia stomach cancers.

PERIAMPULLARY GROWTH

MALE	3
FEMALE	3
TOTAL	6



PERIAMPULLARY CARCINOMAS

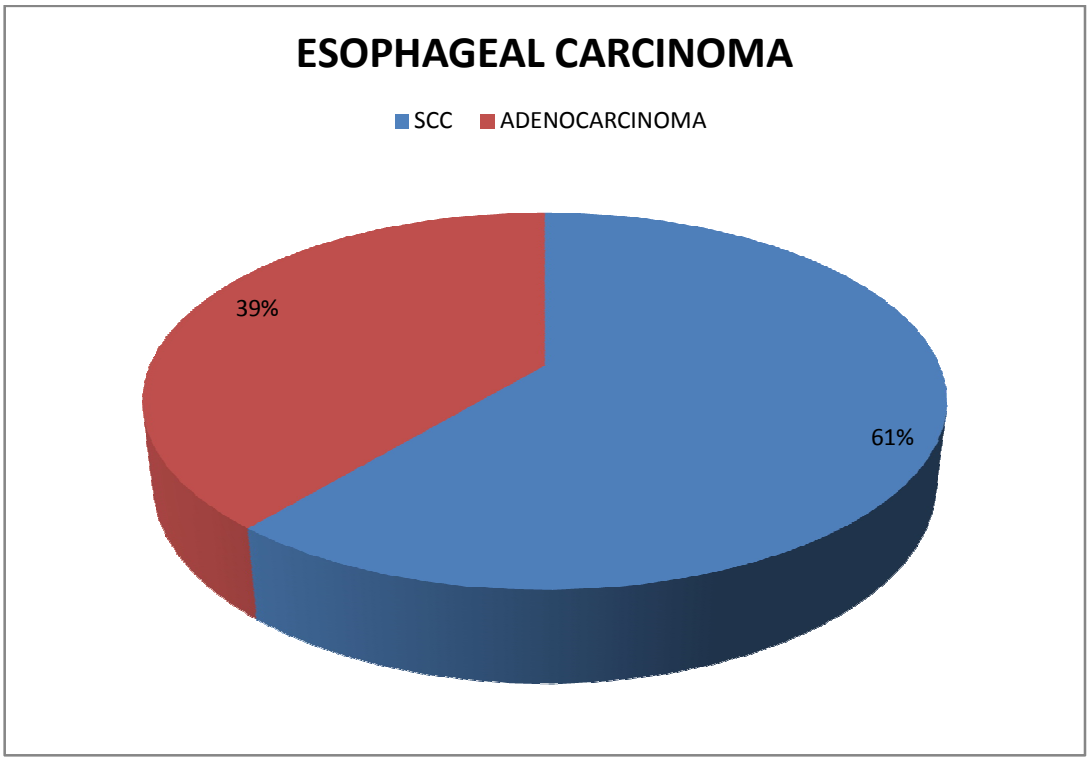
The incidence of periampullary cancers is relatively low in comparsion to other malignancies of upper gastrointestinal tract.In this study only endoscopically diagnosed upper gastrointestinal tumors are included .So periampullary cancers like duodenal and ampullary tumors are included.

Ampullary carcinomas has an overall incidence of six cases for one million in the united states .It accounts for 7% to 19% of all periampullary carcinomas,but it accounts for highest percentage of operative cases.Duodenal carcinomas are less common than the ampullary carcinomas and there least common among the periampullary carcinomas.

Sex distribution in the periampullary carcinomas ,it is almost equal in male and females in this study.However the sample size is very less to compare the sex variation in these carcinomas.only one case is diagnosed as the duodenal carcinomas in this study population.

ESOPHAGEAL CARCINOMA

SQUAMOUS CELL CARCINOMA	11
ADENOCRCINOMA	7
TOTAL	18



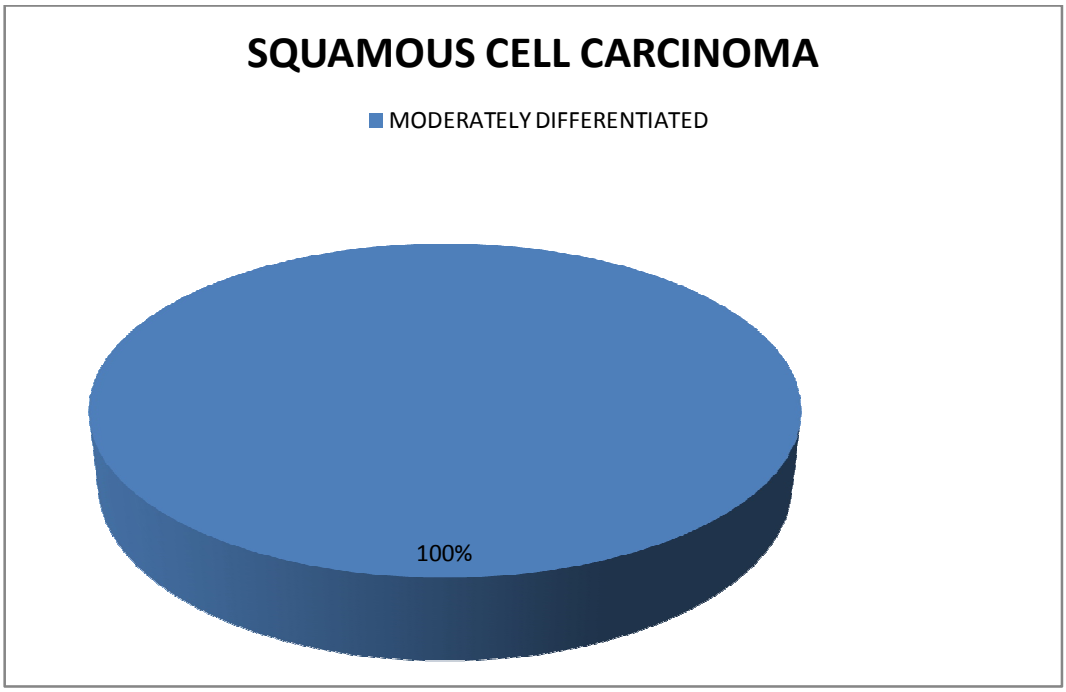
In past squamous cell carcinoma accounted for more than 95% of cases but in recent years due to increased incidence of Barrett esophagus the incidence of adenocarcinoma arising from it.In united states squamous cell carcinoma is around 1.5 to 7 cases per 100000 people.In India it is around 100 to 500 per 10000 people .

Squamous cell carcinoma is five times more common among Africans Americans than in whites ,whereas adenocarcinoma occurs approximately three to four times more common in whites,particularly in men.

In this study the incidence of squamous cell carcinoma is 69% and adenocarcinoma is 39%,which correlates with Indian population.Squamous cell carcinoma is also also common in the upper and middle esophagus and adenocarcinoma more common in the lower segment.

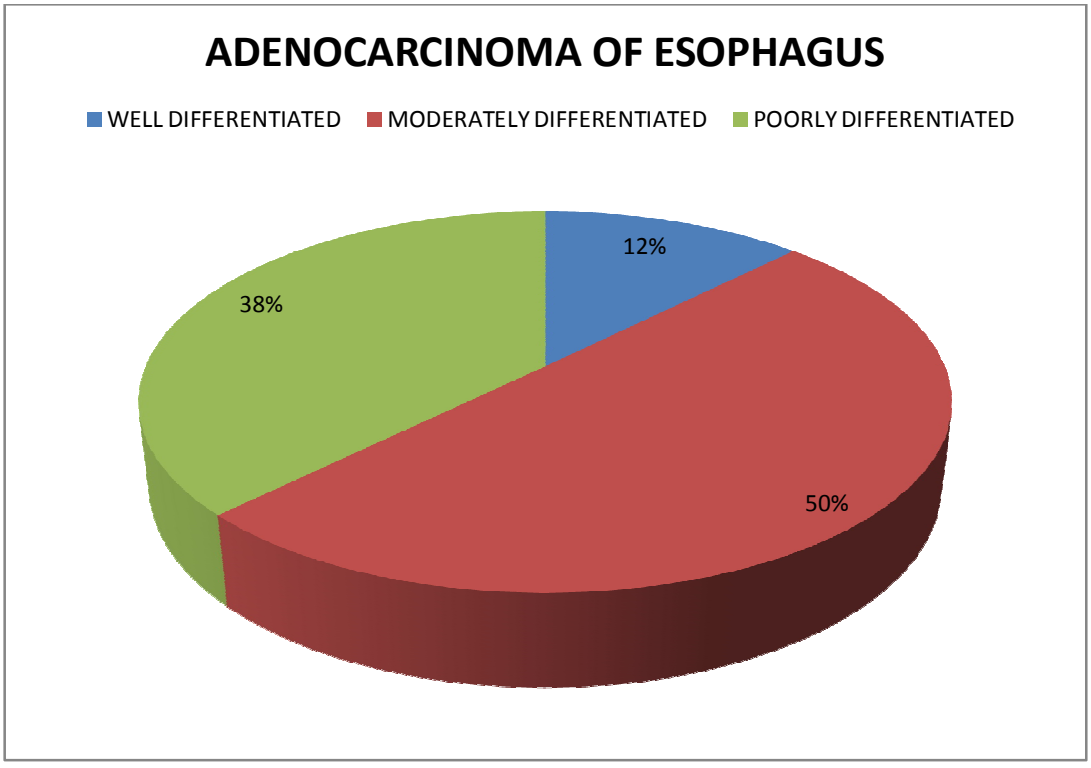
SQUAMOUS CELL CARCINOMA

WELL DIFFERENTIATED	0
MODERATELY DIFFERENTIATED	11
POORLY DIFFERENTIATED	0
TOTAL	11



ADENOCARCINOMA OF ESOPHAGUS

WELL DIFFERENTIATED	1
MODERATELY DIFFERENTIATED	4
POORLY DIFFERENTIATED	3
TOTAL	8

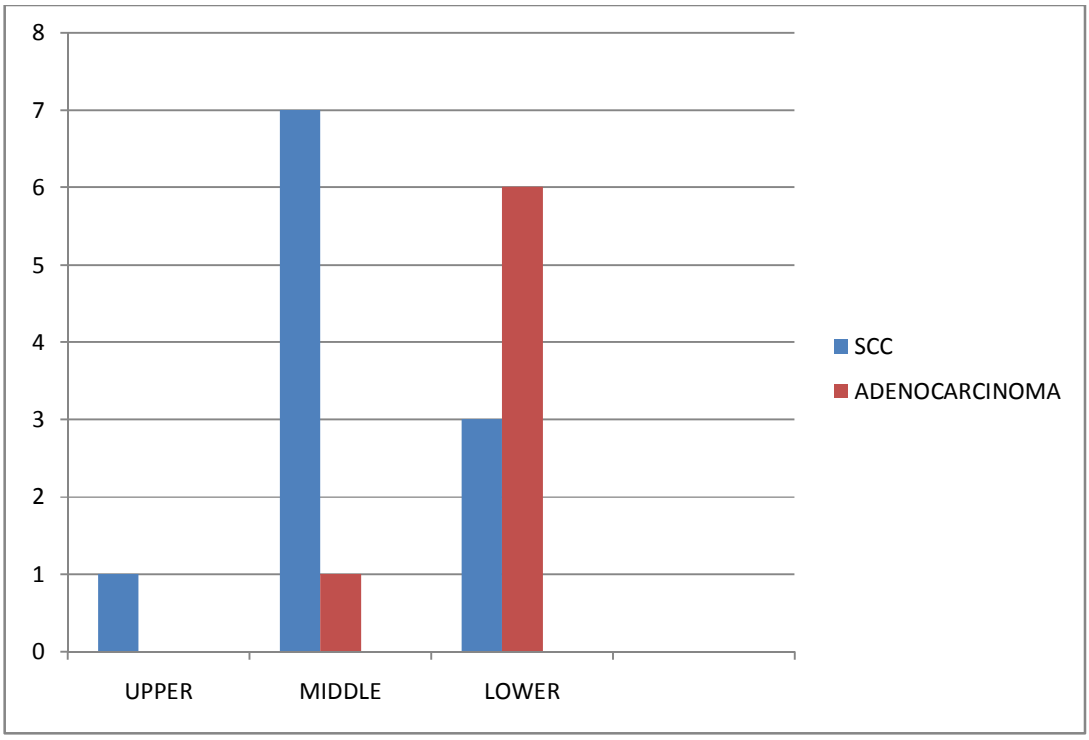


Pathology of the esophageal carcinoma is very important on which treatment is decided.Squamous cell carcinoma is more common and the histology of this is very important in prognosis and treatment.Mostly the tumors are well to moderately differentiated in squamous cell carcinoma.In this study all the patients had moderately differentiated carcinoma.

Adenocarcinomas are increasing at a very high rate compared to any other malignancy.In this study also the adenocarcinomas are comparatively more in number.About 50% of adenocarcinomas are moderately differentiated and next to it 38% are poorly differentiated.only 12% of tumors are well differentiated adenocarcinomas in this study.these differentiation affects the outcome and treatment.

ESOPHAGEAL CARCINOMA

	SQUAMOUS CELL CARCINOMA	ADENO CARCINOMA
UPPER	1	0
MIDDLE	7	1
LOWER	3	6
	11	7

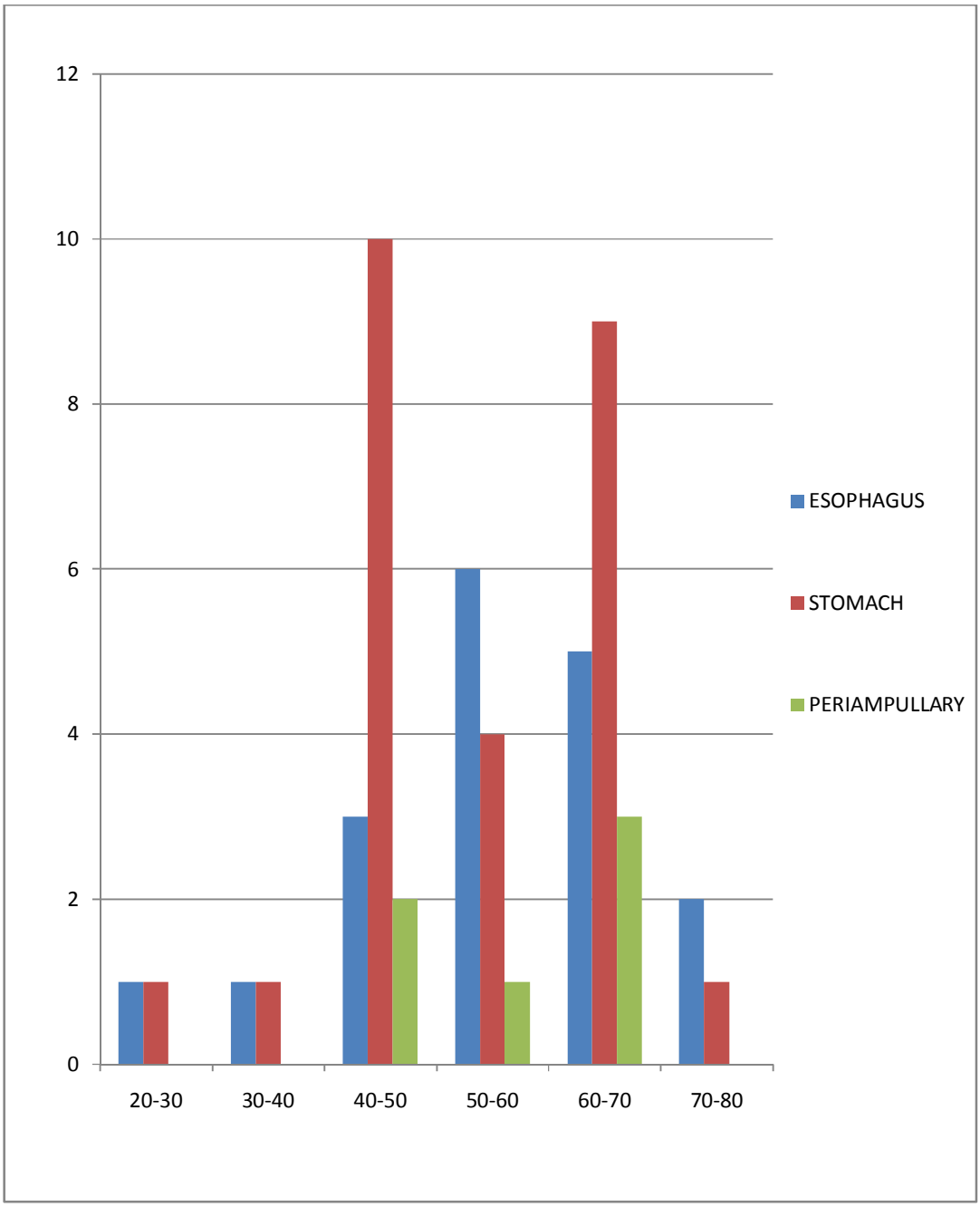


In the esophagus the site of tumor mostly correlates with type of malignancy .squamous cell carcinoma occurs most commonly in the upper and middle third of the esophagus and adenocarcinomas in the lower third of esophagus.

In this study in upper third carcinomas all are squamous cell carcinoma and in middle third of esophagus most of the tumors are squamous cell carcinoma .In lower third of esophagus the incidence is changing ,as adenocarcinomas are more common than sqamous cell malignancies.

AGE WISE DISTRIBUTION OF UPPER GI MALIGNANCIES

AGE	ESOPHAGUS	STOMACH	PERIAMPULLARY
20-30	1	1	0
30-40	1	1	0
40-50	3	10	2
50-60	6	4	1
60-70	5	9	3
70-80	2	1	0
TOTAL	18	26	6


12
10
8
6
4
2
0
20-30
30-40
40-50
50-60
60-70
70-80
ESOPHAGUS
STOMACH
PERIAMPULLARY

The incidence of esophageal adenocarcinoma increases with age, with a median age at diagnosis of 55 to 60 years and a striking male preponderance (7:1)

The incidence stomach cancer also increases with age starting in the fourth decade of life and generally peaks in the seventh decade

In the United States, demographic risk factors for periampullary cancer include age, with the majority of patients in or beyond their sixth decade of life; sex, with a slight male preponderance

In this study esophageal and stomach cancers are seen in age groups from 20 years to 80 years.esophageal cancer occurring mostly in the fifth decade and stomach cancer in the fourth decade.periampullary cancers are occurring from fourth decade to sixth decde,with peak during the sixth decade.

YIELD IN SPECIMENS

The yield of endoscopic biopsy specimens in the individual vials

VIAL NUMBER	NO .OF POSITIVE PATIENTS
FIRST	47 OUT OF 50 (94%)
SECOND	44 OUT OF 50 (88%)
THIRD	27 OUT OF 35(77.14%)
FOURTH	5 OUT OF 12 (41.66%)

In all the fifty patients four samples are obtained with few patients had the difficulty in getting after that.Most of the patients presented to us are with advanced lesions and there was bleeding while taking biopsies from the advanced lesions.so third vial specimen was taken for only 35 patients and fourth vial taken for 12 patients only.

The patients who had bleeding are monitored continuously with fluids and vitals monitoring.Afterwards patients are dischared safely with instructions.

The yield of endoscopic biopsy specimens from 50 patients after combining the results from successive vials

VIAL NUMBER	NO.OF POSITIVE PATIENTS	% OF POSITIVITY
I	47	94%
I+ II	50	100%
I+ II+III	50	100%
I+ II+ III+IV	50	100%

The yield in the first vial is 94% and the cumulative percentage of the second vial yielded 100%.which means the malignancy in the specimen is proved without doubt in the first two vials itself for all the patients.

DISCUSSION

Gastric carcinomas account for the 52% of total malignancies in the upper gastrointestinal carcinomas.Esophageal carcinomas account for about 36% of carcinomas included in this study.Most of the carcinomas are moderately differentiated carcinomas.In esophagus most of the tumors are squamous cell carcinomas though there is increase in adenocarcinomas.In stomach most of the tumors are distal tumors in antropyloric region and all are adenocarcinomas with predominantly moderately differentiated cancers.The endoscopy findings of most of the patients is advanced noduloproliferative or ulceroproliferative lesions.

SUMMARY

Sancho Poch et al'2 found that only one of 66 cases of gastric cancer in which eight specimens had been obtained was negative. However, these authors also did not take into account the order in which biopsy specimens had been taken. Misumi et all3 found that the diagnostic accuracy was 100% in gastric cancers when six or more biopsy specimens were obtained. Most of the other studies are also in gastric cancers and the number of biopsy specimens varied from 4-10.

There are many studies of the diagnostic accuracy of endoscopically performed cytological techniques in the diagnosis of carcinoma of the oesophagus. In these cytological studies, the various authors have either not mentioned the number of biopsy specimens or have taken varying numbers, leaving this to the judgement of the endoscopist' rather than evaluating the optimal number of specimens needed to obtain

the maximum yield. Graham et al' conducted a study in which biopsy and cytology specimens were obtained from 202 consecutive patients, 27 of whom had carcinoma of the oesophagus. In each instance the authors obtained seven biopsy specimens in three groups. Group A contained the first biopsy specimen; group B biopsy specimens 2, 3, and 4; and group C biopsy specimens 5, 6, and 7. In Graham's study, the first biopsy yielded a correct diagnosis in 92-6% of patients with oesophageal cancer; with four specimens accuracy went up to 96%, and with seven biopsy specimens it reached 96-3%. Seven biopsy and cytology specimens yielded a diagnosis in all the cases. Based on their study, the authors recommended that at least seven endoscopic biopsy specimens should be taken in cases of gastrooesophageal malignancy.

CONCLUSION

Our study differs from that of others in that:

(i) we evaluated more patients and the diagnostic yield of four biopsy specimens was 100%;

(ii) two specimens were placed in each of the four vials rather than one, three, and three pieces in three vials; and

(iii) Graham et al also performed salvage cytology while in our study cytological examination was not performed as this was not the aim of the study.

(iv) We didn't get all eight biopsies from everyone due to some complications

(v) In this study we had only advanced lesions of malignancy.

In conclusion, this study shows that four biopsy specimens are likely to yield a 100% diagnosis in advanced upper gastrointestinal malignancies.Whereas the endoscopic biopsy yield in the early stages of carcinomas should be evaluated in further studies.

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NAME	AGE/SEX	ENDOSCOPIC DIAGNOSIS	TOTAL BIOPSY SAMPLES	BIOPSY REPORT	biopsy 1	biopsy 2	biopsy3	biopsy 4
JANAKI	38/F	LOWER ESOHAGUS GROWTH	8	POORLY DIFF ADENOCARCINOMA	pos	pos	pos	-
RAMALINGAM	62/M	MID ESOPHAGUS GROWTH	6	MODERATELY DIFF SCC	pos	pos	pos	
JAYANTHI	58/F	LOWER ESOPHAGUS GROWT	5	MODERATELY DIFF SCC	pos	pos	pos	
RAJAGOPAL	47/M	MID ESOPHAGEAL GROWTH	5	MODERATELY DIFF SCC	pos	pos	neg	
PUSHPA	70/F	LOWER ESOPHAGUS GROWT	5	MODERATELY DIFF ADENOCARCINOMA	pos	pos	pos	
JAYARAMAN	50/M	MID ESOPHAGEAL GROWTH	5	MODERATELY DIFF SCC	pos	neg	pos	
SHANTHI	27/F	UPPER ESOPHAGUS GROWTH	3	MODERATELY DIFF SCC	pos	pos		
VELLANKANI	68/F	MID ESOPHAGEAL GROWTH	4	MODERATELY DIFF SCC	pos	pos		
VASANTHA	48/F	MID ESOPHAGEAL GROWTH	4	MODERATELY DIFF SCC	pos	pos		
SOMASUNDARAM	72/M	LOWER ESOPHAGEAL GROWT	4	MODERATELY DIFF SCC	pos	pos		
RAHMAN	65/M	OG JUNCTION GROWTH	5	POORLY DIFF ADENOCARCINOMA	pos	pos	neg	
GANAPATHI	55/M	OG JUNCTION GROWTH	5	MODERATELY DIFF ADENOCARCINOMA	pos	pos	pos	
KANNAN	59/M	OG JUNCTION GROWTH	5	MODERATELY DIFF ADENOCARCINOMA	pos	pos	neg	
SAROJA	54/F	MID ESOPHAGEAL GROWTH	5	MODERATELY DIFF SCC	neg	pos	pos	
BOBBY	55/M	MID ESOPHAGEAL GROWTH	8	POORLY DIFF ADENOCARCINOMA	pos	pos	pos	neg
SEMAN	75/M	LOWER ESOPHAGEAL GROWT	5	MODERATERLY DIFF SCC	pos	pos	pos	
PANEERSELVAM	62/M	MID ESOPHAGEAL GROWTH	5	MODERATELY DIFF SCC	pos	pos	pos	
SUBRAMANI	55/M	LOWER ESOPHAGEAL GROWT	8	POORLY DIFF ADENOCARCINOMA	pos	neg	pos	pos
GOPI	38/M	UPG STOMACH(BODY)	8	WELL DIFF ADENOCARCINOMA	pos	pos	neg	pos
KALIYAPERUMAL	50/M	UPG STOMACH(ANTROPYLOR	8	POORLY DIFF ADENOCARCINOMA	pos	pos	pos	neg
BALAKRISHNAN	55/M	NPG STOMACH(ANTROPYLOR	8	POORLY DIFF ADENOCARCINOMA	neg	pos	pos	pos
MAHENDERAN	62/M	UPG STOMACH(PYLORUS)	5	INFILTRATING ADENOCARCINOMA	pos	pos	pos	
ARUMUGAM	70/M	NPG STOMACH(INCISURA)	3	MODERATELY DIFF ADENOCARCINOMA	pos	pos		

RANGANATHAN	85/M	UPG STOMACH(ANTROPYLOR	8	POORLY DIFF ADENOCARCINOMA	pos	pos		
CHITRARAJAN	45/M	NPG STOMACH(ANTROPYLOR	4	MODERATELY DIFF ADENOCARCINOMA	pos	pos		
JEYACHANDRAN	64/M	NPG STOMACH(ANTROPYLOR	5	MODERATELY DIFF ADENOCARCINOMA	pos	pos	pos	
MUNIYAMMA	70/F	UPG STOMACH(PYLORUS)	4	WELL DIFF ADENOCARCINOMA	pos	pos		
PREMA	55/F	NPG STOMACH(ANTROPYLOR	6	MODERATELY DIFF ADENOCARCINOMA	pos	pos	pos	
JEYA	55/F	UPG STOMACH(ANTROPYLOR	4	POORLY DIFF ADENOCARCINOMA	pos	pos		
AMBUJAM	65/F	UPG STOMACH(BODY)	6	POORLY DIFF ADENOCARCINOMA	pos	pos	neg	
MURUGAN	65/M	UPG STOMACH(ANTROPYLOR	4	MODERATELY DIFF ADENOCARCINOMA	pos	pos		

SUNAMA BEGAM	47/M	NPG STOMACH(INCISURA)	5	POORLY DIFF ADENOCARCINOMA	pos	pos	pos	
JANAKI	50/F	UPG STOMACH(ANTROPYLOR	3	POORLY DIFF ADENOCARCINOMA	pos	pos		
PAKIRRISAMY	68/M	NPG STOMACH(ANTROPYLOR	4	POORLY DIFF ADENOCARCINOMA	pos	pos		
MARY	65/F	UPG STOMACH(PYLORUS)	8	MODERATELY DIFF ADENOCARCINOMA	pos	pos	pos	neg
RUKMANI	67/F	UPG STOMACH(PYLORUS)	5	MODERATELY DIFF ADENOCARCINOMA	pos	pos	neg	
SELVAM	45/M	NPG STOMACH(INCISURA)	6	POORLY DIFF ADENOCARCINOMA	pos	neg	pos	
DURAIRAJ	67/M	UPG STOMACH(BODY)	6	MODERATELY DIFF ADENOCARCINOMA	pos	pos	pos	
KUMARI	56/F	ULCER STOMACH(ANTROPYL	8	POORLY DIFF ADENOCARCINOMA	neg	pos	pos	neg
RAGUNTHAN	45/M	UPG STOMACH(ANTROPYLOR	6	WELL DIFF ADENOCARCINOMA	pos	pos	pos	
SUGANTHI	28/F	NPG STOMACH(ANTROPYLOR	8	POORLY DIFF ADENOCARCINOMA	pos	pos	pos	neg
MONAHARAN	72/M	UPG STOMACH(ANTROPYLOR	6	MODERATELY DIFF ADENOCARCINOMA	pos	pos	pos	
MANNABEE	44/M	ULCER STOMACH(ANTROPYL	6	MODERATELY DIFF ADENOCARCINOMA	pos	neg	neg	pos
FARHITHA	43/F	UPG STOMACH(PYLORUS)	5	POORLY DIFF ADENOCARCINOMA	pos	neg	pos	
VELAYUDHAM	65/M	PERIAMPULLARY GROWTH	8	MODERATELY DIFF ADENOCARCINOMA	pos	pos	pos	pos
SELVI	42/F	PERIAMPULLARY GROWTH	8	MODERATELY DIFF ADENOCARCINOMA	pos	pos	pos	neg
SUSILA	43/F	PERIAMPULLARY GROWTH	8	MODERATELY DIFF ADENOCARCINOMA	pos	neg	pos	neg
RAMAN	65/M	PERIAMPULLARY GROWTH	6	POORLY DIFF ADENOCARCINOMA	pos	pos	pos	
JOHNNY	53/M	PERIAMPULLARY GROWTH	4	MODERATELY DIFF ADENOCARCINOMA	pos	pos		
FATHIMA	63/F	PERIAMPULLARY GROWTH	5	POORLY DIFF ADENOCARCINOMA	pos	pos	neg	

A DISSERTAITION ON ENDOSCOPIC BIOPSY YIELD IN

UPPER GASTROINTESTINAL MALIGNANCIES

DISSERTATION SUBMITTED TO

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

In partial fulfillment of the regulations for the award of the

M.S.DEGREE EXAMINATION BRANCH I